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A CULTURAL ASSESSMENT OF THE ARCHEOLOGICAL RESOURCES IN THE KEY--ETC(U)

1980 C D CHEEK DACW56-79-C-0259

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A CULTURAL ASSESSMENT OF THE ARCHEOLOGICAL RESOURCES IN THE KEYSTONE LAKE PROJECT AREA, NORTH-CENTRAL OKLAHOMA

Assembled by
Bruce M. Moore

Charles D. Cheek,
Principal Investigator

Archeological Research Associates
Research Report No. 23

1980

(14) RR-2

(6) A CULTURAL ASSESSMENT OF THE ARCHEOLOGICAL RESOURCES

IN THE

KEYSTONE LAKE PROJECT AREA, NORTH-CENTRAL OKLAHOMA

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Archeological Research Associates
(9) Research Report No. 23

(11) 1980

Issued in Fulfillment of

(15) Contract ~~No.~~ DACW56-79-C-0259

from the

United States Army Corps of Engineers

Tulsa Office

ABSTRACT

A reconnaisance survey of the Keystone Lake Project Area resulted in the discovery of 270 sites, of which 198 have prehistoric components and 83 have historic components. The condition of previously recorded sites was updated in the course of the survey.

Individual sites are evaluated with respect to their age and cultural affiliation; the manner in which they are exposed; their size, elevation, and geographical setting; and, the activities which occurred there. Attention is also given to the impact of the lake, of past agricultural and industrial activity, and of present recreational activity on the sites themselves and on the population of surface artifacts in the project area as a whole. The lake is indicated as being particularly destructive to sites, the great majority of which are exposed along the shoreline and are only apparent as beach scatters below an eroding bank or slope. Test excavations, described for prehistoric sites, largely confirm the adverse impact of the lake. Beach scatters--the primary source of artifactual data--are described as being maintained in a state of skewed uniformity through intense and extensive recreational collecting. Recreational collecting is cited as a significant deterrent to inferences about the age and cultural affiliation of sites and to the activities that occurred there.

Specialized chapters discuss the environment, prehistory, and history of the project area; the discovery of a probable Copan-equivalent paleosol

during a geomorphologic survey of the project area; the theoretical and practical problems encountered in designing alternative statistical sampling programs for a lake centered project area; and, the relative susceptibility of project area sites to the forces of erosion. This report is in partial fulfillment of Contract DACW56-79-D-0259 between Archeological Research Associates and the U.S. Army Corps of Engineers, Tulsa District.

ACKNOWLEDGMENTS

Many individuals contributed to the completion of this report. Most notable in my own mind, however, are Charles Cheek, who acted as principal investigator, and Annetta Cheek, who co-authored a chapter and offered technical and editorial advice. I am indebted to Charles and Annetta for the opportunity to participate in the Keystone Lake Survey and for the encouragement and beneficial prodding which they provided.

The field crew consisted of Steven Conley, Kelley Duncan, Connie Douglas, Steven Imhoff, Mark Lodgsdon, Barry Shelley, Linda Stewart, and Carmel Swidler. I am especially indebted to Steven Imhoff, who served as Assistant Field Director and auto mechanic.

The interviews conducted with private collectors proved to be an especially enjoyable part of the project. I am grateful to the many kind individuals who welcomed me into their homes and who provided a wealth of archeological and historical information about the project area.

I am also indebted to the individuals who contributed chapters or appendices to this report. They are Annetta Cheek, Eric Milstead, Curtis Northrup, Nan Richeson, Neil Salisbury, Barry Shelley, and Carmel Swidler. Nan Richeson is also to be thanked for her secretarial assistance.

Maps were drafted by Karen Howarth. Photographs were prepared by Keith Hice. The final draft was typed by Sharon Phillips.

Acknowledgment is also made to the Idaho State Museum of Natural History for permission to reproduce Figure 8-1, and to the University of Oklahoma, Oklahoma River Basin Survey for permission to reproduce Figure 8-2.

Finally, the Corps of Engineers, through their representative Wayne Shields, aided the project in many ways.

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CHAPTER 1

INTRODUCTION

The idealized program for the management of archeological or cultural resources, in projects such as where a dam is to be built and a reservoir developed, envisions five stages of planning and archeological activity preceeding the completion of project construction (see Vivian, Anderson, Davis, Edwards, Schiffer and South 1977:66-71). In the course of the five stages archeologists are envisioned to work with project planners in increasingly area-specific activities to determine (1) the nature, distribution and significance of the resource base (a) within a region and (b) within a specific project area; (2) the possible alternatives to project location and project design; (3) the probable impacts of each alternative on the resource base; and (4) the proper mitigation action to alleviate the impacts. Mitigation is expected to take place before a project is executed or, at the very latest, in phases during project construction.

However, when conservation of the cultural resource base does not become a matter of overt concern until after project construction has been completed and operations begun, the stages of the idealized management program must necessarily be collapsed and the scope of proposals and expectations revised accordingly. This is the case in the Keystone Lake Project Area where a dam was built, a reservoir filled, and recreation areas developed long before much overt attention--beyond a partial preconstruction assessment survey--was given to how the resource base would be affected by these activities and by the visitors who would be attracted to the project area.

The result has been that conditions for research and mitigation are now less than ideal in the project area. Both sites and land forms have been permanently inundated. Sites within the normal extremes of the fluctuating lake pool have been severely eroded and laid bare to repeated vandalism. Sites above the lake pool have been severely disturbed or even destroyed in the course of construction and recreation activities. All of these conditions pose obstacles to drawing cultural inferences, constructing and testing models and assessing the historical significance of sites. Moreover, the same conditions may either lessen the effect of mitigative measures for individual sites or proscribe some or all of the measures which might have been taken before the major construction (and filling) phase was completed. Thus, it is from this starting point that the management of the cultural resource base in the Keystone Lake Project Area must now proceed.

Keystone Lake is located in north-central Oklahoma, approximately 24 km west of Tulsa (Fig. 1-1). The man-made lake is formed from the impounded waters of the Arkansas and the Cimarron rivers and their tributaries. Keystone Dam, the major impounding facility, is located on the Arkansas approximately 2.90 km below its confluence with the Cimarron. The dam was built and it and the entire Keystone Lake Project Area are administered by the United States Army Corps of Engineers, Tulsa District.

The project area includes a total of 9,396 land hectares (22,994 acres) in five counties (Fig. 1-1). Included is all of the exposed land below the full-flood control pool (754 ft. MSL) and any other portion of the Corps-owned land or "fee area" above the elevation of the full-flood control pool. The eastern edge of the project area is approximately 1.61 km below the dam. Above the dam the boundary of the project area generally

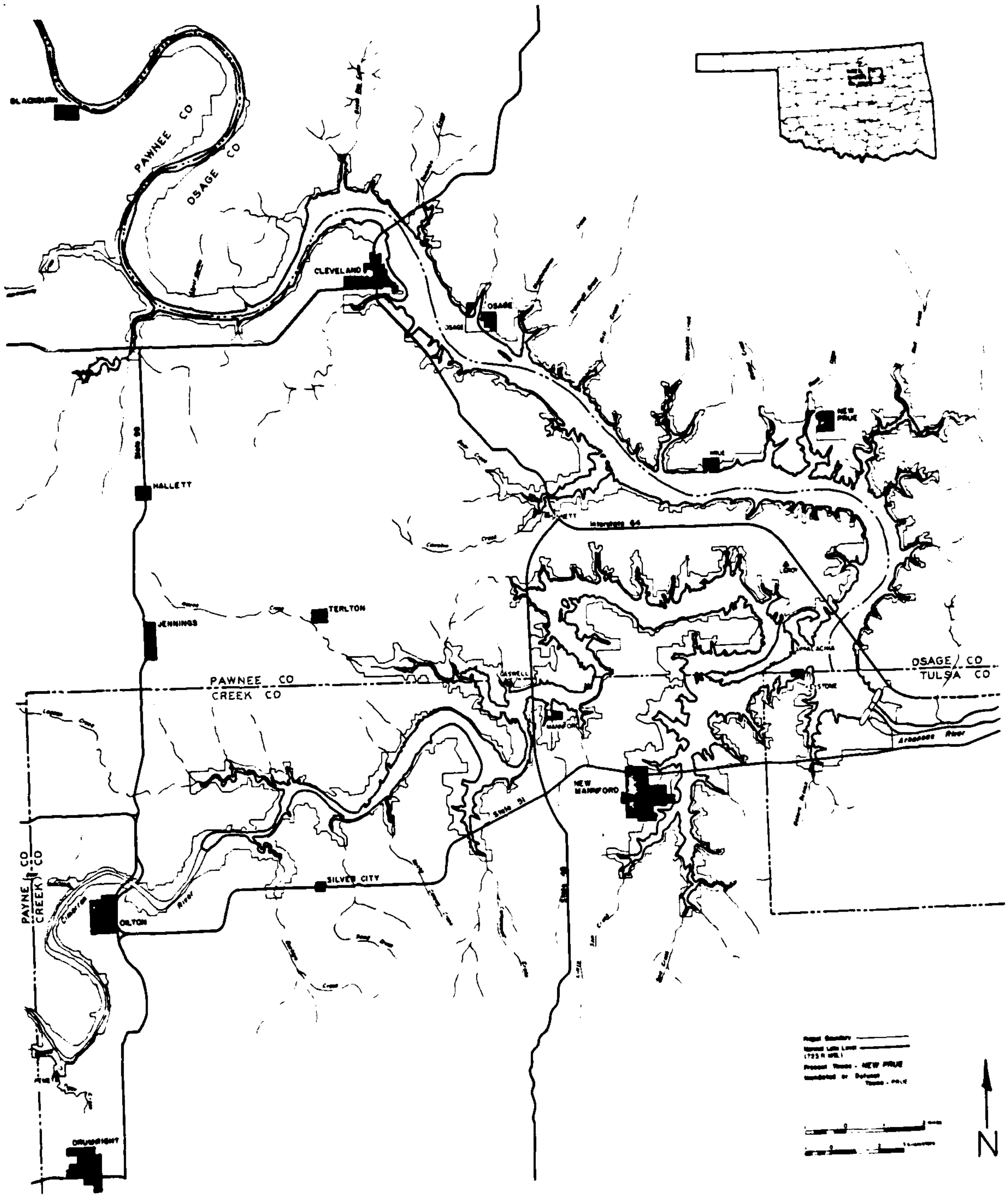


Figure 1-1. Keystone Lake Project Area

parallels the path of the rivers, the western edge being the Payne County line along the Cimarron and the northern boundary of Section 16 (T. 22N., R. 7E.) where the Arkansas crosses it approximately 5.60 km east of the town of Blackburn.

Most of the land acreage in the project area is blanketed by oak forest leaf mold or indigenous grasses. The major exceptions are (1) city or state-leased parks and Corps-owned parks which have been planted with Bermuda grass or paved with gravel, concrete or macadam; (2) tracts leased by farmers and (3) unvegetated beaches and mudflats along the shoreline of the rivers and tributary creeks. Evidence of prehistoric human activity, in particular, is confined largely to the latter.

In 1979 Archeological Research Associates contracted with the Army Corps of Engineers (Contract No. DACW-56-79-C-0259) to conduct a survey to locate, describe and evaluate the cultural resources (both prehistoric and historic) which lie between the approximate top of the power pool (723 ft. MSL) and the project boundary. The purposes of the investigation were to provide input into a cultural resource management plan for the project area and to comply with Executive Order 11593. The present volume constitutes the final report on that investigation.

Field work, which included both a survey phase and a test excavation phase, ran from October 8 through December 14, 1979. All site survey forms are on file at the Oklahoma Archeological Survey, Norman, Oklahoma; all collections made during the survey and test excavation phases are on deposit at the Stovall Museum of the University of Oklahoma, Norman. The names and addresses of private collectors interviewed in the course of the investigation are retained in the personal files of the senior author. They are identified in the text by parenthesized cardinal numerals. A total

of 2,712 person-hours were required to complete the survey of the project area.

The report itself is divided into four parts. Part I provides environmental, archeological, and historical background information, as well as a discussion of soil-geomorphic relationships with sites. Part II describes the survey and test excavation phases of the investigation and draws inferences regarding the prehistory of the project area. Recommendations for future research are also included in Part II. Part III, in a single chapter, assesses the suitability of alternate regional sampling strategies in the particular geographic setting of the project area. Part IV makes recommendations for the mitigation of impacted sites in the project area. Prefatory chapters evaluate the impact of non-scientist collectors on project area sites and on the population of surface artifacts and adapt and critique an existing predictive model for ranking sites according to their relative susceptibility to erosional processes.

PART I. BACKGROUND

CHAPTER 2

ENVIRONMENTAL SETTING

Keystone Lake was formed by impounding the Arkansas and Cimarron rivers three kilometers below their confluence, flooding the respective river valleys where they cross areas of Osage, Pawnee and Creek counties, as well as small portions of Payne and Tulsa counties (Fig. 1-1). Most of the following data are drawn from Soil Conservation Service reports on the three primary counties.

Topography

The local topography is characterized by cuesta formations, ridges formed by westward dipping strata that terminate in steep east facing slopes. Elevations in the area vary between 152 and 304 meters above mean sea level. The two geomorphic provinces represented are the Eastern Sandstone Cuesta Plains, where the majority of the project area falls, and, to a lesser extent, to the west, the Northern Limestone Cuesta Plains (Curtis and Hamm 1972:3). These two provinces are illustrated in Fig. 2-1.

Geology

The Eastern Sandstone Cuesta Plains are composed of sedimentary rock of the Pennsylvanian Era, 320 million years old, with interbedded sandstone, limestone and coal resting on marine shales. The Northern Limestone Cuesta Plains are Permian era sedimentary rock, 270 million years old,

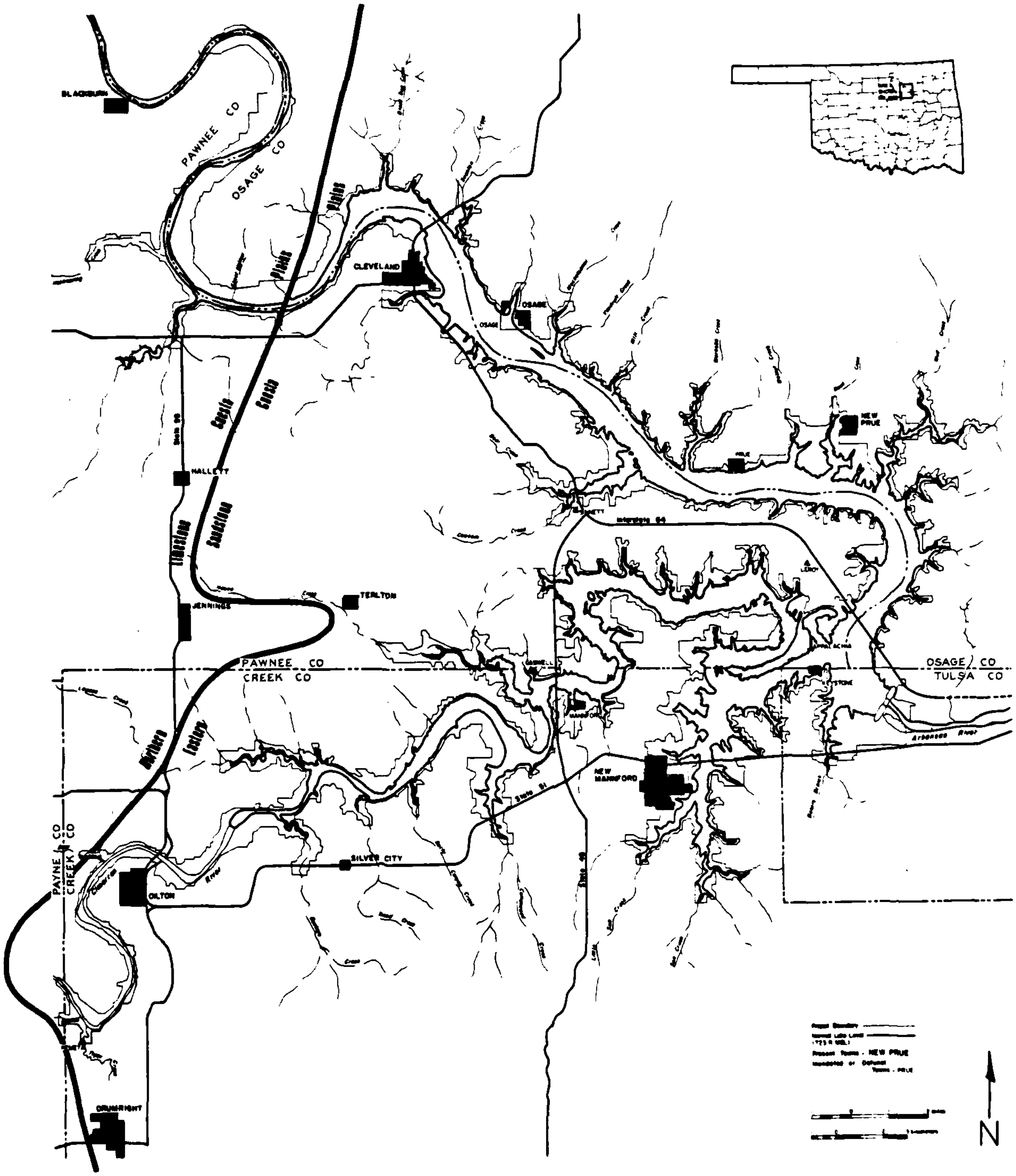


Figure 2-1. Geological Provinces

with interbedded limestone and sandstone resting on marine shales (Johnson, Branson, Curtis, Ham, Marcher and Roberts 1972:4).

These sedimentary rocks were originally deposited flat. During the Permian Era mountains were formed as a result of the geologic action of the Flint Hills Monocline. The cuesta's westward dip averages about eight meters per kilometer (Soil Conservation Service 1959a:44). The softer exposed shale areas were cut away during the formation of the Arkansas and Cimarron river valleys. The more resistant limestone and sandstones were left forming the cuestas. The river valleys are composed mainly of alluvial and aeolian depositional sequences of sand, silt, clay and gravel on floodplains and terraces.

Soils

During the investigation of the different soil associations present in Osage, Pawnee, Creek, Tulsa and Payne counties, a substantial list of soils was compiled for each county. Because of minimal continuity between county soil surveys and because the soils of each county possess similar morphology and ecology, the soil associations are presented as three groups: Wooded Upland soils, Bottomland soils and Prairie soils.

The Wooded Upland soil association occurs on sloping upland valley walls, ridgetops and terraces and can, as a group, be described as deep to shallow, moderately sloping to steep, sandy, loamy soils. These soils generally have a coarse texture.

The Bottomland soil association occurs on floodplains and terraces in the river and stream valleys and varies widely in nature. It can be characterized as deep, nearly level, well to poorly drained, loamy and sandy soils. The texture of this material ranges from fine to coarse.

The Prairie soil association has a more diverse geographic distribution. These soils occur on valley floors, valley walls, high terraces and ridgetops and are described as shallow to deep, level to sloping loamy soils. These soils generally have a fine texture. More complete descriptions can be found in Appendix A, where soils are treated as associations and series.

Hydrology

The major drainages at Keystone Lake are the Arkansas and Cimarron rivers. The Arkansas flows in a generally northwest to southeast direction with a gradient of 0.5 meters per kilometer, while the Cimarron flows in a west southwest to east northeast direction, with an average gradient of 0.5 meters per kilometer. The drainage area of the two rivers extends from the Rocky Mountains in Colorado across southern Kansas and northern Oklahoma (Dorris 1967:4-5).

Numerous small creeks in shallow narrow valleys separated by narrow stony ridges flow into the two rivers in the survey area. Seeps and springs are also present in the area, providing an economically valuable amount of water.

Climate

The climate in the five county survey area in mostly continental in type, having well defined seasons which are warm to temperate and humid. Summers are long and hot, while winters are short and comparatively mild. Typically, freezing temperatures are followed by periods of milder weather.

Meteorological records from the period 1925-1975 for Osage, Pawnee and Creek counties show that the average winter temperature is 3°, and

the lowest temperature recorded is -25°, while the highest recorded temperature is 47°C. The last freeze is usually late in March and the first freeze of winter is usually in November. The average number of frost-free days in the growing season in 219.

Annual precipitation varies between 86 and 94 centimeters. April, May and June have the highest rainfall. The seasonal snowfall ranges from 15 to 25 centimeters. Most of the moisture is brought into the drainage area by warm, moist air currents moving northward from the Gulf of Mexico, producing frontal cyclonic rainfall as the air currents come into contact with cooler, drier air masses moving southward from the continental interior (Dover 1968:7).

Low humidity and southerly breezes usually accompany higher temperatures in the summer. Strong, hot winds which occasionally accompany high daytime temperatures produce rapid evaporation. When these conditions persist for a long time, droughts develop. These droughts can be severe enough to damage vegetation.

Biotic Community

Osage, Pawnee and Creek counties are situated in the Cross Timbers ecotone. This represents a transition between the Oak-Hickory Forest to the east and the Tall Grass Prairie to the west. The areas underlain by shale have a prairie vegetation of tall grass while the areas underlain by sandstone generally have a scattered forest of post oak and blackjack oak, with grasses growing in open areas (Soil Conservation Service 1959a:2). The Cross Timbers can best be described as a forest savanna. Stands of post oak and blackjack oak grow in the sandy uplands, where the soils provide adequate moisture. Grasses occur in scattered openings

where finer silty soils collect in depressions and there is less available moisture. More hydric vegetation is confined to the bottomland community where hickory is also present. Open prairies of bluestems, Indiangrass and switchgrass occupy the areas underlain by deeper clayey loams to the west of the survey area. This area has little available moisture.

Flora

The Post Oak-Blackjack Forest type represents the forest-grassland ecotone. It contains dominant species from both the Oak-Hickory Forest and the Tall Grass Prairie. The Post Oak-Blackjack type is most evident on rolling sandy uplands with coarse textured relatively poor soils. These are the areas of the Wooded Upland soil association. Rapid water percolation in these soils limits the amount of available nutrients and weak acids formed by decomposing leaves leach away nutrients in the soil (Soil Conservation Service 1959b:55). To the west of the survey area, open stands of post oak and blackjack oak occur on sandy ridgetops, while the dominant forms of vegetation in the area are prairie grasses. These open stands of oak are dominated by small scrubby growths of blackjack oak which are able to tolerate xeric conditions. Table 2-1 is a listing of the prominent species of the Wooded Upland community. It is derived from the Soil Conservation Service reports and Duck and Fletcher. A list of species which have been recorded ethnographically as being exploited are marked with an asterisk (Bousman 1978:26-41, Carlson and Jones 1939: 517-542).

Table 2-1. Flora of the Wooded Upland Community

Taxon	Common Name
Quercus stellata	*Post oak
Q. marilandica	*Blackjack oak
Carya texana	*Hickory
Juniperus virginiana	*Eastern red cedar
Q. velutina	*Black oak
Cercis canadensis	Redbud
Betula nigra	River birch
Andropogen scoparius	Little bluestem
A. gerardii	Big bluestem
Cephalanthus occidentalis	Button bush
Rhus glabra	*Smooth sumac
Stophostyles hevola	Trailing wild bean
Allium sp.	*Wild onion

The Bottomland association includes the first bottom and the stream courses of all regular drainages. The soils of these areas are very fertile due to the constant addition of organic material and new alluvial deposition. The bottomland represents the broadest inventory of resources in the survey area. Table 2-2 is a listing of the prominent species of the Bottomland community.

The Tall Grass Prairie is an area of nearly all open grassland with an occasional invasion of oaks on sandy ridgetops. This is a transitional area between the Post Oak-Blackjack Forest and the Short Grass Prairie. Grasses grow well here in soils of medium and low amounts of rainfall. Principal species in the Tall Grass Prairie community are listed in Table 2-3.

Fauna

The Post Oak-Blackjack Forest of the wooded uplands provides a habitat which accommodates many of the animals which would have been exploited

Table 2-2 Flora of the Bottomland Community

Populus deltiodes	Eastern cottonwood
Celtis occidentalis	*Hackberry
Carya illioensis	*Pecan
Plantanus occidentalis	American sycamore
Carya texana	*Hickory
Quercus borealis	Northern red oak
Q. palustris	Pin oak
Q. muehlenbergii	*Chinquapin oak
Q. macrocarpa	*Burr oak
Ulmus americana	*American elm
Acer rubrum	Red maple
Fraxinus pennsylvanica	Green ash
Maclura pomifera	Osageorange
Robinia pseudoacacia	Black locust
Diospyros virginiana	Persimmon
Gleditsia triacanthos	*Honey locust
Juglans nigra	*Black walnut
Morus rubra	*Red mulberry
Salix	Willows
Ulmas serotina	*Red elm
Prunus	Plum
Gymnocladus dioicus	*Coffeetree
Cephalanthus occidentalis	Buttonbush
Cercia canadensis	Redbud
Cornus drummondii	Roughleafed dogwood
C. florida	Flowering dogwood
Psedera quinquefolia	Virginia creeper
Rhus toxicodendron	Poison ivy
Prunus serotina	Chinaberry (Wild china)
Similax sp	*Greenbriar
Symphoricarpos orbiculatus	Buckbrush
Sapindus drommondii	Western soapberry
Crataegus sp.	*Hawthorn
Vitas sp.	*Wild Grapes
Carex sp.	Sedges
Galium aparine	Bedstraw
Panicum anceps	Beaked panicum
Panicum virgatum	Switchgrass
Paspalum floridanum	Florida paspalum
Sagittana latifolia folia	*Arrowhead
Scripis validus	Soft stem bulrush
Rhus aromatica	*Skunk bush
Typha latifolia	*Cattail
Prunus sp.	*Wild plum
Prunus agustifolia	*Chickasaw plum
Bumelia languinosa	Chittamwood

Table 2.2 (Continued)

Taxon	Common Name
Phytolacca americana	*Pokeberry
Polygonum pennsylvanicum	Smartweed
Spartina pectinata	Prairie cordgrass
Tripsacum dactyloids	Eastern gramagrass
Uniola latifolia	Broadleaf spikegrass

Table 2-3. Flora of the Tall Grass Prairie Community

Taxon	Common Name
Andropogon scoparius	Little bluestem
A. gerardii	Big bluestem
Panicum virgatum	Switchgrass
Sorgastrum nutans	Indiangrass
Bouteloua curtipendula	Sideoats grama
B. gracilis	Blue grama
Buchloe dactyloides	Buffalograss
Tripsacum dactyloides	Eastern gramagrass
Amorpha canescens	Leadplant
Babtisia spp.	Wildindigo
Demanthus illionoensis	Illinois bundleflower
Lespideza capitata	*Roundheaded lezpideza
L. procumbens	Trailing lesbedeza
L. virginiana	Slender lespedeza
Psoralea tenuiflora	Wild alfalfa
Helianthus sp.	*Perennial sunflower
Ratibida columnaris	Prairie coneflower
Silphium lacinatum	Compassplant
Prunus augustifolia	*Chickasaw plum
Rhus glabra	*Smooth sumac
Symphoricarpos orbiculatus	Buckbrush
Opuntia compressa	*Prickly pear

for their food value by prior area inhabitants. Table 2-4 provides a partial list of the large and small game animals now found in the wooded uplands.

Some of the better game environments are located in the Bottomland, which is capable of supporting a variety of different species, including

those from the wooded upland and prairie communities. Nearly all the resources available in the survey area are represented in varying numbers in the bottomlands. Table 2-5 presents those species associated with the Bottomland community.

Table 2-4. Fauna of the Wooded Upland Community

Taxon	Common Name
Odocoileus virginianus	White-tail deer
Sylvilagus floridanus	Cottontail rabbit
S. aquaticus	Swamp rabbit
Sciuris niger	Fox squirrel
Mephitis mephitis	Striped skunk
Didelphis marsupialis	Opossum
Mustela frenata	Long tailed weasel
Procyron lotor	Raccoon
Mustela vison	Mink
Canis latrans	Coyote
Vulpes fulva	Red fox
Urocyron cinereoargenteus	Grey fox
Ondatra zibethica	Muskrat
Taxidea taxus	Badger
Colinus virginiana	Bobwhite quail

Table 2-5. Fauna of the Bottomland Community

Taxon	Common Name
Odocoileus virginianus	Whitetale deer
Canis latrans	Coyote
Mephitis mephitis	Striped skunk
Castor canadensis	Beaver
Sylvilagus floridanus	Cottontail rabbit
Sciuris niger	Fox squirrel
Sciuris sp.	Grey squirrel
Colinus virginiana	Bobwhite quail
Procyron lotor	Raccoon
Mustela vison	Mink
Ondatra zibethica	Muskrat
Vulpes fulva	Red fox
Urocyron cinereoargenteus	Grey fox
Didelphis marsupialis	Opossum
Mustela frenata	Long tailed weasel
Sylvilagus aquaticus	Swamp rabbit

The animals of the Tall Grass Prairie are typical of the Great Plains grassland fauna. The species which are historically associated with the tall grass community are shown in Table 2-6.

Table 2-6. Fauna of the Tall Grass Prairie Community

Taxon	Common Name
Canis latrans	Coyote
Mephitis mpehitis	Striped skunk
Taxidea taxus	Badger
Colinus virginiana	Bobwhite quail
Tympanachus cupido	Greater prairie chicken
Lipus californicus	Blacktailed jackrabbit
Perognathus hispidus	Plains pocket mouse
Onochomys leucogaster	Grasshopper mouse
Reithrodontomys montanus	Plains harvest mouse
Neotoma micropus	Plains woodrat
Cynomys spl	Prairie dog
Geomys bursarius	Pocket gopher
Spermophilis spp.	Ground squirrel
Bison bison	Buffalo

Ethnographic Information on Floral Resource Utilization

A survey of ethnographic literature has resulted in a list of floral resources available in the survey area that were used by native inhabitants of the region. The list was assembled using material on the Comanche, Kiowa, Caddo, Cheyenne and Missouri River tribes (MRT) of Gilmore (1919). Reviewing these resources on a seasonal basis will allow some insight into what resources were available, when they were available and which were chosen for use.

In the Southern Plains, three groups of plants were collected and eaten by the various Indian tribes; fruits, roots and nuts. The fruits

that were eaten included plums, blackberries, prickly pear, mulberries, hackberries and grapes. Roots utilized included sunflower, cattail, bulrush, thistle and wild onion. Pecan, black walnut with burr, blackjack, post and acorns were also eaten (Bousman 1978:26).

Table 2-7 was compiled by Bousman using previously published works on the subject which included Carlson and Jones (1939), Gilmore (1919), Grinnell (1972a, b), Hammond and Rey (1953), McCormick (1973), Newcomb and Field (1967), Vestal and Schultes (1939) and Winship (1896).

Resource Utilization

The Bottomland community supplies the widest variety of resources with the longest seasonal availability. Factors supporting multi-seasonal resource exploitation include highest available amount of water, the greatest abundance of wildlife and also the greatest diversity of plant forms (Losher 1975:45).

The Post Oak-Blackjack community represents the second largest supplier of resources. Acorns provide the primary edible plant resource. Acorns and nuts can be roasted, shelled, boiled or made into flour.

The Tall Grass Prairie community provides the least of the three areas in terms of plant resources, but it is not devoid of potential. The primary sources of plant food are roots, tubers, foliage, berries and seeds. The seeds, roots and tubers of many plants can be converted to flours which can then be utilized in a number of fashions. Flour can be made into bread, cakes, soups and gruels (Chase 1965:13).

Many of the animal species in the project area are not restricted to one community. Because of the close proximity of the communities,

Table 2-7. Ethnographic Resource Utilization

Plant	Habitat	Use	Seasonal Availability
Juniperus virginiana (Red cedar)	Upland forests	Comanche ate fruit.	Spring Summer
Typha latifolia (Cattail)	Upland forests Bottomlands	Caddo ate roots raw, roasted, dried, ground into flour.	Summer Fall Winter
Sagittaria latifolia (Arrowhead)	Upland forests Bottomlands	MRT boiled or roasted tubers.	Summer Fall
		Cheyenne ate young stalks raw.	Spring
		Caddo ate roots raw, boiled, roasted.	Summer Fall
Scripis validus (Soft stem bulrush)	Upland forests Bottomlands	MRT ate tender base of stem raw.	Spring Summer Fall
Allium sp. (Wild onion)	Upland forests	Comanche ate roasted bulbs.	Spring Early Summer
Similax sp. (Greenbriar)	Upland forests Bottomlands	Caddo used fruits in soups, jellies, bread.	
		MRT ate fruit.	Spring
Carya illinoesis (Pecan)	Upland forests Bottomlands	Comanche ate nuts.	Fall
Juglans nigra (Black walnut)	Upland forests Bottomlands	Kiowa, MRT ate nuts plain, with honey or soup. Caddo ate raw or boiled. Comanche ate nuts.	Fall
Quercus macrocarpa (Burr oak)	Upland forests Bottomlands	MRT leached acorns with ash to eat.	Fall

Table 2-7. (Continued)

Plant	Habitat	Use	Seasonal Availability
Quercus marilandica (Blackjack oak)	Upland forests	Kiowa ate acorns, made into drink. Comanche ate acorns.	Fall
Quercus stellata (Post oak)	Upland forests	Kiowa dried, pounded and cooked acorns.	Fall
Celtis occidentalis (Common hackberry)	Upland forests Bottomlands	Kiowa pounded berries into a paste, moulded on stick and cooked. MRT pounded berries and mixed with meat or corn.	Fall
Ulmus americana (American elm)	Bottomlands	Kiowa made tea from inner bark dried and stored for winter use.	All Year
Ulmus fulva (Red elm)	Bottomlands	Caddo made cakes from inner bark.	
Morus rubra (Red mulberry)	Upland forests Bottomlands	Comanche ate fruit. Caddo ate raw or dried for winter.	Late Spring Summer
Phytolacca americana (Common pokeberry)	Bottomlands	Caddo boiled shoots for greens.	Spring
Crataegus sp. (Haw)	Upland forests Bottomlands	Comanche ate fruits.	Fall
Prunis agustifolia (Chickasaw plum)	Upland forests Bottomlands	Comanche stored fruit or ate fresh. Caddo ate fresh or in cakes.	Late Spring Early Summer

Table 2-7. (Continued)

Plant	Habitat	Use	Seasonal Availability
Prunus sp. (Wild plum)	Upland forests Bottomlands Prairie	Comanche ate fruit fresh or dried for winter. Plains Apache and Wichita ate fruit.	Summer
Gleditsia trianchanthos (Honey locust)	Bottomlands	Caddo obtained sugar from pods.	Summer
Gymocladus dioica (Kentucky coffeetree)	Bottomlands	MRT pounded and roasted the seeds.	Summer Winter
Strophostyles helvola (Trailing wild bean)	Upland forests	Caddo ate seeds raw or boiled.	Summer
Rhus aromatica (Skunk bush)	Upland forests Bottomlands	Kiowa ate berries or made into a drink.	Summer
Rhus glabra (Smooth sumac)	Upland forests Bottomlands	Caddo ate peeled raw shoots. Comanche children ate fruits.	Spring Early Summer Summer
Vitus sp. (Wild grape)	Upland forests Bottomland	Comanche ate fresh fruits or dried fruits for winter.	Fall
Opuntia compressa (Prickly pear)	Upland forests Bottomland	Cheyenne dried fruits, flesh and seeds were added to stews and soups. MRT ate fruits raw, stewed or dried for winter use. Caddo ate fruits raw or boiled.	Summer Summer Summer
Helianthus annus (Common sunflower)	Bottomlands	Cheyenne ate tubers or roots.	All Year

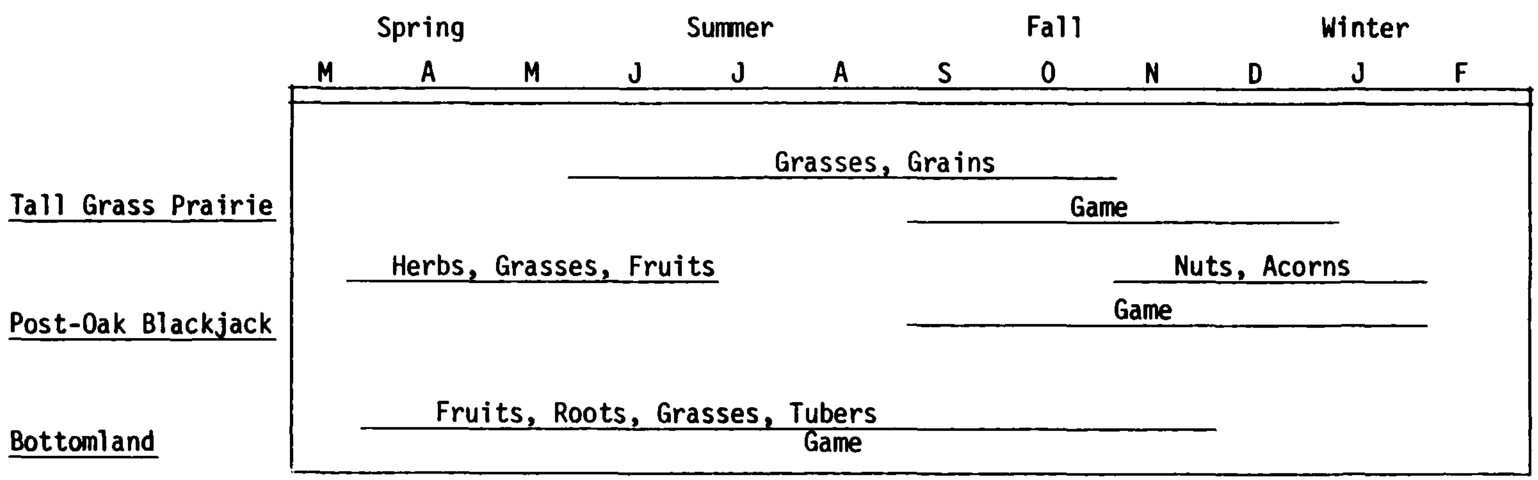
such species may range through all three. All game animals listed in Table 2-6 could have been exploited for meat and additional resources. Secondary drainages in the project area support mussels, crayfish and a number of species of fish. These animals, along with amphibians, birds and reptiles, represent additional resources. Figure 2-2 compares the resource availability of the three communities.

One final resource available in the general region must be mentioned. Various chert deposits occur, and were utilized by prehistoric inhabitants for the manufacture of lithic tools. The distribution of some of the major chert sources is shown in Figure 2-3.

Paleoclimate

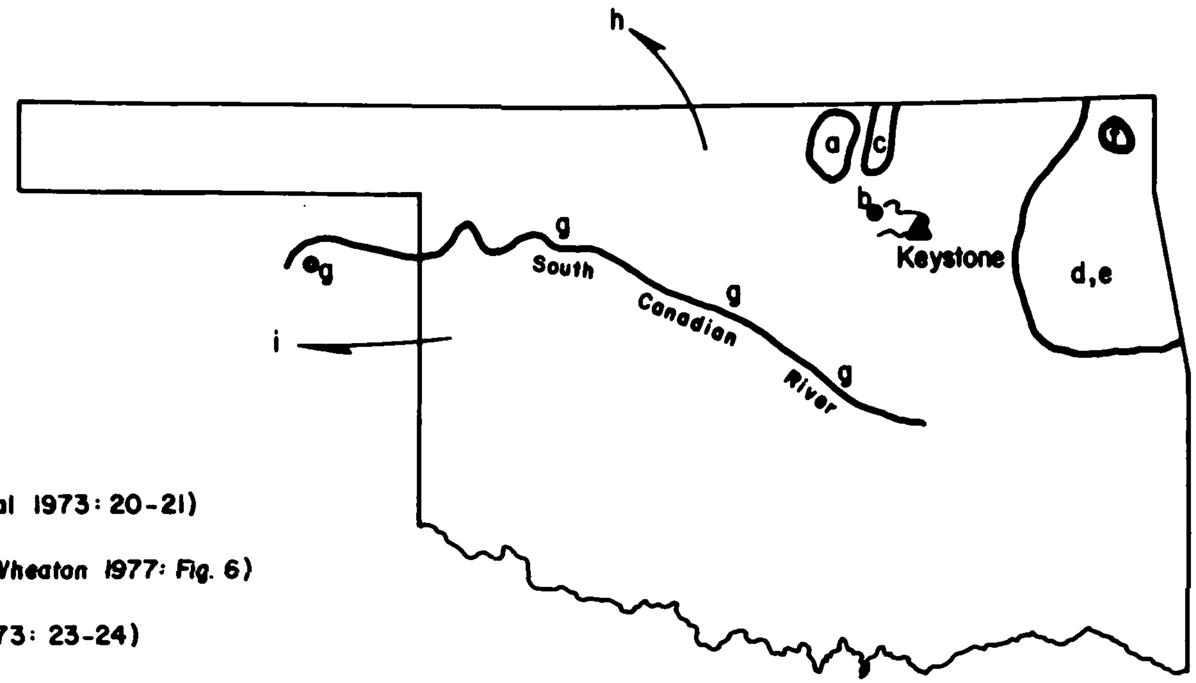
Floral assemblages which constitute ecozones can exist in a specific geographic area only with limited amounts of climatic variation. Greater variability results in a loss of the integrity and identity of the group. In response to episodes of climatic change, the expressed characteristics of floral communities would have been altered in specific geographic areas in such a way to adapt to the varying climate. Major episodes of climatic change which resulted from extreme variations in existing climate would alter the entire assemblages to a degree that they would no longer exist in the same area. Minor episodes of climatic fluctuation could result in little or no change or could bring about major changes over a protracted course of time.

The nature of the dynamics of climate change is a disputed subject. In some areas of the Plains, a model of gradual change has been developed (Antevs 1955; Ritchie 1967, 1969; Shay 1967), while others postulated rapid climatic shifts which produced the shorter stable periods (Bryson,



(After Losher 1975:46)

Figure 2-2. Seasonal Resource Availability



a Kay County Chert (Neal 1973: 20-21)

b Neva Chert (Neal and Wheaton 1977: Fig. 6)

c Shidler Chert (Neal 1973: 23-24)

d Keokuk Chert (Briscoe 1977: Fig. 41)

e Cotter Dolomite (Briscoe 1977: Fig. 41)

f Peoria Chert (Neal and Wheaton 1977: Fig. 6)

g Alibates Dolomite (Drass 1979: 41)

h Yellowstone Obsidian (Wallis 1977: 23)

i New Mexico and Colorado Obsidian (Wallis 1977: 23)

Figure 2-3. Probable Sources of Lithics Utilized in the Keystone Lake Project Area

Baerreis, Wendland 1970; Bryson and Wendland 1967). Supposedly an analogous situation can be drawn for the South Plains area.

Despite the differences in opinion concerning the nature and extent of changes, several fluctuations have been documented which indicate climatic variations in the areas of central and southeastern Oklahoma. This information was taken from archeological and non-archeological contexts. The climatic changes were recorded by measuring variations in frequency of occurrence of pollen from specific species of arborescent and non-arborescent flora.

Pollen analysis of the sediments of Holocene oxbow lakes at several localities in south-central and southeastern Oklahoma (Bond 1966) has indicated a spectral shift from arborescent pollen to non-arborescent pollen returning to arborescent pollen. The palynological samples with the greatest time depth were represented by arborescent pollen in their lowest and hence oldest stratigraphic units. These units were interpreted to represent a cool, moist climate during the post-Wisconsin glaciation and pre-Hypsithermal period. This is followed by samples yielding predominately non-arborescent pollens which posited (without the benefit of radiocarbon dates) to date to the Hypsithermal period. This period of greater aridity lasted for about 4,000 years, possibly from 7,000 to 3,000 B.P. The last major pollen shift indicated non-arborescent pollens gradually being dominated by arborescent pollens which suggest a cooler, wetter trend in climate (Bond 1966:52-54).

Palynological work done in northeastern Oklahoma in Hominy Creek Valley by Henry (1978) provides an idea of the local variations in climate during the past two millenia. (Cf. Sanders and Wyckoff's [1976:7-8] opinion that regional vegetation histories based on pollen samples from

archeological sites may be skewed by past human and animal activity and by the vagaries of preservation.) From about A.D. 300 to about A.D. 900, the area had an oak-hickory association in the upland and supported a mesic to hydric array of vegetation. Sometime around A.D. 800 there was a decline in the hickory and walnut in favor of the more xeric species of oaks. During this period, grass pollens remained low in frequency. Also at about A.D. 900 an arid-tolerant species of snail (Tridotopsis cragnini) appears to have become more prominent. This seems to suggest some slight drying trend in the surrounding area (p. 88). However, overall, the total climatic record suggests that there has been no major change in the ecology of the Hominy Creek Valley area. The vegetation does not appear from the palynological record to have changed appreciably during the time late prehistoric man was in the area.

The Cross Timbers ecotone area contains dominants from the Post Oak-Blackjack Forest and the Tall Grass Prairie. There is a marked observable variation between the east and the west portions of the survey area in the vigor of the oak-grass interaction. At the east end of the survey area, continuous tracts of oak trees are occasionally invaded by small openings of grasses. The understory of the forest does not include a major element of grass. As the ecotone proceeds westward, grassy openings occur more frequently until oak and grasses occupy comparable amounts of territory. Proceeding outward to the western portions of the survey area, the grasses expand to form open prairie which is occasionally interrupted by stands of post oak-blackjack occurring on sandy ridgetops.

Both oaks (Quercus stellata, Q. marilandica) and tall grasses (Andropogon scoparius, A. gerardii) are well suited for the environment. The extent of their range depends on the amount of available moisture, primarily determined by precipitation but also by soil type.

In response to episodes of severe drying, the xeric oak population would slowly retreat to the east and southeast with the grasses expanding into the opening territory as it became available. Greater available moisture would allow the oaks to move westward, and would extend the grasses westward also. When climatic conditions reverted to the pattern of a former episode, it was not always possible for the previous plant associations to be equally reestablished. Similar environments separated by time often produced dissimilar plant communities (Dort 1968).

Depending on the direction of change, organisms for which the previous environment provided only marginal existence might have been able to expand or else might have been forced out completely, and the intensity of competition among other organisms shifted accordingly. The sensitivity of the ecozone would be the primary factor in this variability. Available moisture, a combination of precipitation and soil characteristics, appears to have been a more important factor than extremes of temperature in changing floral patterns in northeastern Oklahoma. During these climatic fluctuations, it is probably that the geographic location of the boundary between ecozones varied and that the individual ecozonal community was not altered (Bryson and Wendland 1967; Jennings 1968). As the boundary moved, the composition of the flora probably changed relative to a specific location, while the composition of an ecotone probably did not change. That is, the ecotone might have moved, and the vegetation in the area became that of the dominant ecozone. These floral shifts might have been accompanied by changes in the composition of the faunal array. If the prehistoric people were dependent on the more environmentally sensitive species, the zonal shift might have stimulated changes in behavioral patterns through necessity to abandon dependence on resources which were no

longer available. Although cultural patterns are not altered entirely due to a changing subsistence base, behavioral changes due to interaction with the environment could be viewed as a substantial factor leading to larger comprehensive cultural changes.

CHAPTER 3

PREVIOUS ARCHEOLOGICAL RESEARCH AND CULTURAL-HISTORICAL BACKGROUND

This chapter describes the organized, scientific research which has previously taken place in the Keystone Lake Project Area. It also outlines the prehistory of the region in which the project area is located.

Previous Archeological Research

Previous field work in the project area is confined to two cursory site surveys and three excavated burials. Aside from the published or unpublished reports which document these investigations, there are only two other published articles devoted to the archeology of the project area. Both document out of the ordinary projectile points discovered by non-scientist collectors.

Brighton Survey

The initial and formerly the most substantial scientific investigation conducted in the project area was an assessment survey undertaken in April and May of 1952 by Harold D. Brighton (1952), a University of Oklahoma graduate student. The investigation was sponsored jointly by the University of Oklahoma, the Smithsonian Institution and the National Park Service and was carried out prior to the beginning of the construction phase. Highlights of the Brighton survey were published by Robert E. Bell (1952a, b).

The purpose of the survey and the procedures employed must be inferred from Brighton's text. It is rather in one of Bell's reports (1952b)

that an overt statement of purpose is found. "The survey," he writes (p. 8), "is intended to locate sites of archeological or historical interest which may be destroyed upon construction of the Keystone Reservoir." With respect to matters of procedure, Brighton apparently intended an extensive rather than an intensive survey of the project area. Both river valleys and nearly all of the major tributary valleys were visited, though his efforts were apparently concentrated on exposed land areas along river and stream banks, in arroyo and road cuts and in cultivated fields. Brighton drew on local informants for many of his sites and others were inspected--if not actually discovered--through stereoscopic analyses of aerial photographs (1952:20). Artifact collections were made (Richard Drass 1980, personal communication) and test excavations were conducted at several sites. Brighton does not report the former activity and there is no discernible rationale behind which sites were selected for the latter activity. Information reported for each site is essentially that called for by the contemporaneous Oklahoma site survey form.

Eighty-four sites and 24 features were discovered in the course of the survey. Brighton classifies as "features" localities "which suggest possible occupation or suggestion of significance [sic] to the project . . . [but for which] . . . there are not evidences [sic] apparent to record them as a site number" (1952:20). Apparently conceived of as a catch-all category for miscellany, Brighton includes as features likely site localities, informant identified sites not found, sites not visited and isolated artifacts and features. In turn, three classes of sites are distinguished: camps, villages and burials. "The area of surface finds, type of material found, the amount of material and the evidence as to

depth of occupation, were used in an attempt to determine whether a site was a camp or a village" (p. 2). He allows that these criteria were applied with varying degrees of success and that some sites may have been neither a camp nor a village.

Brighton's report concludes with sets of recommendations for future research and observations about the cultural and natural resources of the project area. With respect to the former set excavation is recommended at 11 sites, all of which are relatively large and possessed of abundant amounts of cultural debris. Otherwise, their characteristics--and the rationale behind their excavation--vary and include the presence or absence of ceramics, the presence of a house pattern, the presence of stratification suggesting multiple occupations and the presence of an unknown point class in association with ceramics.

Finally, Brighton (1952:2, 23-24) offers the following observations about the resource base of the project area:

1. Only one burial site was discovered; the remainder of the sites are either villages or campsites.

2. Some of the rockshelters listed as sites or features may possess a PaleoIndian component.

3. A hunting and gathering horizon probably preceded the use of ceramics [by horticulturalists?].

4. Seven sites may possess a proto-historic component.

5. "The majority of these [sites] were along the main stream or larger creeks on the second flood plain or the edge of the second terrace. In other areas, the sites appear only at the mouth of small streams. Bends of the two rivers, opposite high bluffs, usually contain sites. A few sites were also found on the higher table land just above the flood pool."

6. Hunting and gathering sites are found throughout the project area.

7. The "pottery seems to center in the lower part of the reservoir and for the most part, on the Arkansas River."

8. Proto-historic sites are concentrated near the Arkansas and Cimarron rivers.

9. Ceramics were discovered at only five of 84 sites.

10. ". . . no exotic types of materials were found within the Keystone Reservoir. . . ."

11. "No flint was apparent in the gravel beds of the streams and it is logical to assume from several accounts on sites of the area, that it was an item of trade within this area."

Hofman Survey

The only other survey in the project area was conducted in 1978 for the Oklahoma Department of Parks and Tourism by the Oklahoma Archeological Survey. The survey was part of an A-95 program in which the impact on the archeological resources of proposed projects in eastern Oklahoma was assessed. Aside from the state site survey forms the only available information about the survey has come from a letter from the field surveyor, Jack L. Hofman (1980, personal communication). Hofman's task was to inspect six areas in Walnut Creek State Park, Osage County, where a pavillion and additional picnic facilities were to be constructed. These areas were visited over a two day period in August. Hofman found the construction areas to be "densely vegetated," however, and reports that he chose to inspect the nearby beaches as an indirect means of their site potential. In the course of the beach surveys, he discovered eight sites

from which he took grab samples from the artifacts of six. In all, Hofman inspected the construction areas and approximately four km of shoreline. Hofman reported his findings to the archeologist in charge of A-95 projects, who in turn submitted a letter describing their findings and recommendations to the appropriate agencies. A copy of this letter could not be located.

Burial Excavations

The circumstances surrounding the excavation of the three burials are essentially the same. In each instance an archeologist was called upon to excavate a burial which was exposed by wave action along the lake shore. Two of the excavations are documented in print and the third has been reported by informants. Both of the documented burials were discovered on Pw-54 on the north shore of the Arkansas river. One was excavated by Don Wyckoff (1969) and the other by Gregory Perino (n.d.), perhaps the same year or a year earlier. Wyckoff reports a primary adult burial, the body having been laid in a pit in a right-side-down flexed position with the head probably toward the south. A small, unidentified point was found in the fill approximately nine inches above the bones. Informant 9a admits having removed portions of one burial from nearly the same spot before he reported the site to Wyckoff.

Curtis Norrell (1979, personal communication), a park ranger, has identified Pw-54 as the site where the burial excavated by Perino was found. In what appears to be the rough draft of an apparently unpublished news release, Perino (n.d.) describes having found the burial in a "village area." He reports a primary adolescent burial, the body having been laid in a left-side-down flexed position. The individual wore two 5 cm-long bead-like ornaments made from the long bone of a bird. Perino

estimated the age and cultural affiliation of the burial from artifacts observed on Pw-54 and perhaps other sites close by. He concludes that its age is perhaps 600 to 700 years and its cultural affiliation perhaps was with "a peripheral group who associated with Caddoan people in and around the Spiro Mounds area" (n.d.:1).

The unreported burial described by Informants 2a and 2b may well be a verbal account of the latter burial. Perino has no memory of either burial (1979, personal communication) and the informants could not be reached later on (while we were responding to the review comments on this chapter) to clarify the matter. By their account, the body was also placed in a flexed position and is thought to have been found on either Pw-54 or westward across the cove on Pw-94.

Other Reports

The final class of reports describes and illustrates a number of late PaleoIndian and early Archaic artifacts (see the following section), surface collected from the river gravels below Keystone Dam by a non-scientist husband and wife team (5a and 5b). In one of the two articles, Bell (1977) documents four lanceolate points clasified respectively as Clovis, Folsom, Scottsbluff, and possibly Eden. Each was manufactured from an exotic variety of chert (McClung 1979:6).

In the second article, Terry L. McClung (1979) documents a Cody Knife and several other lanceolate points clasified respectively as Clovis, Meserve, Plainview, and Scottsbluff. More recently, one of the points (No. 1 of Fig. 1) has been classified by Bell (in a letter to the couple) as a Redstone point (see Cambron and Hulse 1964 and Perino 1968). Both locally-occurring cherts (e.g., Shidler) and exotic cherts are represented in the collection. In his concluding remarks McClung (1979:7)

ponders the significance of the varying degrees of river wear or patina noted on the artifacts. Observing that some exhibit little or no wear, he then expresses the belief that "many of these artifacts have not moved far down the river from their original context, perhaps a few miles at most."

Regional Prehistory

Although previous research in the project area did not include cultural-historical syntheses, it is apparent from the evidence that four spatially variable and temporally overlapping cultural manifestations--here distinguished as cultural periods--are represented among the prehistoric sites. Even with the added data from the present investigation, these four periods are still best documented by research done to the north of the project area in an arc extending from Oolagah Lake on the northeast, to the Kaw Reservoir and southern Kansas on the north, and to the Pawnee area on the west. The following discussion draws largely from published research in this arc to provide background information about the four cultural periods. As thd discussion is intended neither as a substantive contribution nor as a critical review of the literature, readers interested in greater detail about specific periods or localities or about the archeology of north-central and northeast Oklahoma as a whole are directed to the following recent publications: for the Oolagah Lake region, Prewitt (1968); for the Copan region, Farley and Keyser (1970); for the Hominy Creek Valley, Henry (1978); for the Birch Creek Valley, Henry (1977b); for Candy Creek, Saunders (1980); for the Shidler and Salt Creek areas, Neal (1973) and Vehik, Buehler, and Wormser (1979); for the Kaw Reservoir area, Hartley (1974), Rohrbaugh (1973, 1974), and Young (1978b); for the Pawnee area, Hackenberger (1976), Wallis (1977, 1979), and Young

(1978a); and for a general discussion of the archeology and prehistory of the north-central and northeast Oklahoma, Cheek (1978:15-26).

Paleo-Indian Period

The initial occupants of north-central Oklahoma were bands of migratory hunters and gatherers. Although these bands probably had at least a moderately diversified economy, as do all modern hunting and gathering societies but the Eskimo, they are best known as hunters of such now extinct late Pleistocene species as the mammoth and the bison. These "big game hunters" are also known for the projectile points--both basally fluted (e.g., Clovis and Folsom) and unfluted (e.g., Plainview)--which they manufactured and employed in the kill.

Documented Paleo-Indian sites have not been reported in north-central Oklahoma, although a number of projectile points have been found in the gravels and on the sandbars of the Arkansas River in particular (Bell 1971, 1977; Brighton 1952:23; McClung 1978; Wyckoff 1965:6). The closest known example of a Paleo-Indian site is the Packard Site (Wyckoff 1964), which is located over 161 km to the east of Keystone Dam on the western edge of the Ozark Plateau. The contents of a firepit from this site yielded a Carbon-14 date (R-1070/4) of 7,456 B.C. $\pm$ 193 years. The estimated span of the Paleo-Indian Period in north-central Oklahoma falls between 10,000 B.C. when Colvis complex hunters perhaps entered the region and 5,000 B.C. when the Pleistocene megafauna had surely passed into extinction.

Archaic Period

Following, if not concurrent with, the climatic shift which contributed to the extinction of the Pleistocene megafauna, modern plant and animal species became the object of subsistence strategies. In contrast

to the "big game hunters" of the previous period, the hunters and gatherers of the Archaic Period are inferred to have generally possessed a highly diversified forest economy, a stronger regional orientation which was perhaps encouraged by the inferred practice of exploiting seasonally available food resources, and an increased permanency of residence. Based on her findings at the Lawrence Site, Jane Baldwin (1969) has inferred that regionalization or the tendency toward the local procurement of resources and permanency of residence increased over time.

Archaic Period assemblages in north-central Oklahoma are characterized by a variety of contracting and expanding stemmed large projectile points, bifacially flaked blades, large scraping instruments, and grinding implements. Pottery is not yet present in the Archaic Period and the bow and arrow have not yet replaced the atlatl and dart as a weapon.

Archaic Period sites in north-central Oklahoma include the Freeman Site (Bastian 1969), Hogshotter Site (Howard 1970), Pw-63 (Neal and Wheaton 1977), and the Vickery Site (Rohrbaugh 1974). Suggested dates for the Archaic Period in north-central Oklahoma are 5,000 B.C. to A.D. 1.

Plains Woodland Period

The hunting and gathering economy of the Archaic Period continued into the subsequent Plains Woodland Period where it was gradually supplemented in some areas by simple horticulture. A semisedentary existence is suggested by the presence of large sites and thick deposits, storage pits, and artificial mounds. There also appears to have been a mixed proliferation in the number of Plains Woodland "settlements," although, as Henry (1977b:8) observes, "the apparent increase in sites may be an

expression of the differences in geologic settings and exposures of sites from the two prehistoric periods."

Several technological advances occurred during the Plains Woodland Period. One of these, horticulture, has already been mentioned. In north-central Oklahoma evidence of horticulture is indirect, consisting of storage pits and grinding implements. However, Young (1978a:9) suggests that maize horticulture did appear in the region sometime after A.D. 500, although his inference is based on maize grains on the dated Pruitt Site (Barr 1966) of south-central Oklahoma. Pottery and the bow and arrow also first occurred during the Plains Woodland Period, both perhaps by A.D. 200 (Young 1978a:8-9). The adoption of the bow and arrow in inferred from the presence of small, corner-notched Scallorn points in assemblages containing large, stemmed dart points.

The construction of artificial mounds also occurred at least along the eastern margin of the region, where several mound groups have been reported in the Little Caney River-Copan Lake area (Henry 1977b:6) and in the Skiatook Lake area (Gettys and Lahye 1976:116). Assemblages from excavated mounds vary in the presence and absence of ceramics and in the predominance of large or small projectile points. Two of the three mounds excavated on the Weston Site (Howard 1970) contained burials covered with sandstone slabs.

At least one attempt (Bastian 1969) at distinguishing Eastern Woodland phases (Early, Middle, Late) in the Plains Woodland Period of Oklahoma and Kansas has met with some criticism. Based on his work at the Von Elm Site in the Kaw Reservoir area, Hartley (1975:129) in particular suggests that all that can be demonstrated at the present time is that plain pottery and the large, stemmed projectile points are dominant in

the earlier components while the smaller corner-notched points and cord-marked ceramics are dominant in the later components.

Relationships with the Eastern Woodland complexes of northeastern Oklahoma, Kansas, and Missouri are felt by Hartley (1975:129) to have occurred within the context of a "loosely defined Woodland interaction sphere" in which trade and stimulus diffusion obtained. The presence in north-central Oklahoma of pottery making, zoned dentate-stamped pottery, discoid "scrapers," and several varieties of expanding stemmed dart points are accounted for in this manner.

Plains Woodland Period Sites in north-central Oklahoma include the Freeman Site (Bastian 1969), Hammons Site (Young n.d.), Hudsonpillar Site (Bastian 1969), Pw 63 (Neal and Wheaton 1977), Von Elm Site (Hartley 1974), and the Vickery Site (Rohrbaugh 1974). Suggested dates for the Plains Woodland Period in north-central Oklahoma are A.D. 1 to A.D. 900.

Plains Village Period

A new subsistence strategy emphasizing floodplain horticulture emerged in the subsequent Plains Village Period. Food resources such as the modern bison, fish, and wild plant products were supplemental to a diet consisting largely of cultivated maize, beans, and squash. Settled village life accompanied the horticultural economy, although the settlement plans varied with the Early and Late phases which are distinguished. Suggested dates for the Plains Village Period as a whole in north-central Oklahoma are A.D. 900 to A.D. 1600.

Early Plains Village habitation sites were scattered along the terraces flanking major tributaries and consisted of 3 to 10 square, four-post houses, a substantial midden deposit, and bell-shaped or straight-sided

storage pits (Wedel 1961:95). Characteristic tools included small, triangular side-notched arrow points (Huffaker, Morris, Reed, etc.), and unnotched arrow points (Fresno), cordmarked and plain ceramics, and stone or bone farming and hide-working implements. In north-central Oklahoma, the Bowling Alley Site (Sudbury 1968), Ka 65 (Young n.d.), Freeman Site (Bastian 1969a), Longshelter Site (Henry 1977c), and the Stockton Site (Neal 1974) are representative Early Plains Village occupations.

In the Late phase (beginning ca. A.D. 1500), there was a general population shift to the east and a trend toward aggregation into large fortified villages situated along major rivers (Wedel 1964:207-208). Additions to the material culture included locally manufactured sand and shell tempered, punctated and incised pottery; small, stemmed arrow points; occasionally recovered trade wares from the Southwest; and, toward the end of the phase, glass and metal objects of European origin. In north-central Oklahoma Late Plains Village components are present in the Copan area (Farley and Keyser 1979:8) and in the Kaw Reservoir area (Hartley 1974:10; Young 1978b).

CHAPTER 4

A BRIEF HISTORY OF THE LAKE KEYSTONE AREA

There is no evidence that either early Spanish or French explorers entered that part of Oklahoma referred to in this study as the Keystone Lake Project Area. The Spaniard Hernando De Soto may have traveled about 50 miles to the east of the area during his exploration of 1539-1542 (Morris, Goins, and McReynolds 1976:11). Later in 1719, the French explorer Bernard de la Harpe may have passed closer than the 50 mile perimeter of De Soto (Morris, Goins, and McReynolds 1976:13). The earliest documented instance of Americans entering the area is in 1806 when an ill Lt. James B. Wilkinson, of the Zebulon Pike expedition, and five soldiers boated, hiked, and canoed down the Arkansas River to New Orleans (McReynolds 1964:55-58).

The first extensive exploration of the area by the United States was commissioned by President Andrew Jackson in 1832. The exploration party consisted of three Indian commissioners, several mounted rangers, Osage Indian guides, and Washington Irving, who was joining the party to gain information for his upcoming book, A Tour of the Prairies. The party was officially dispatched to report on the nature of the area in regard to the settlement of the southern Indian tribes into the territory. The exploration began in 1832. On the night of October 15, 1832, the expedition encamped at Bear's Glen (Thoburn 1932:430), which today is a quiet cove, the first one on the lake along the shoreline north of

U.S. 64. The campsite itself is permanently inundated. Previously, the Irving party had crossed the Arkansas River at a ford called U.S. Crossing (Gardner 1933:77). This was used as a low-water ford as late as the opening of the Cherokee Strip in 1893. The party then went west along the Cimarron before heading south and out of the project area. (For more details of Irving's journey, see Shirk 1967).

Before the establishment of any Anglo communities, different parts of the project area were controlled by various Indian groups. The Creek Nation controlled the southern portion of the triangle of land between the two major rivers (Fig. 4-1). Prior to Andrew Jackson's Policy of Removal, the Creek Nation extended over eastern Alabama and southwestern Georgia. After the War of 1812, white westward expansion increased the conflicts between the Indian and the Anglos. Jackson's attitude toward the Indian Nations, including the Creeks, was that as organized societies they would have to be moved to the west of the Mississippi River to reduce interference with white westward expansion. The Creek Removal Treaty was signed in Washington on March 24, 1832. The boundaries of their new nation were not described until the Montfort Stokes Commission in 1833. The Creeks were placed between the Choctaw Nation on the south and the Cherokee Outlet on the north. The Creeks in 1832 had a population of over 22,000. The journey across Arkansas proved to be a terrible hardship for the tribe. From 1830 to 1860, the decline of the Creek population was over 40 percent (McReynolds 1956:140).

The Creek immigrants settled along the Arkansas and Verdigris rivers. Some Creek families owned large numbers of black slaves. Roley McIntosh and Benjamin Perryman, among others, ran large farming operations. These

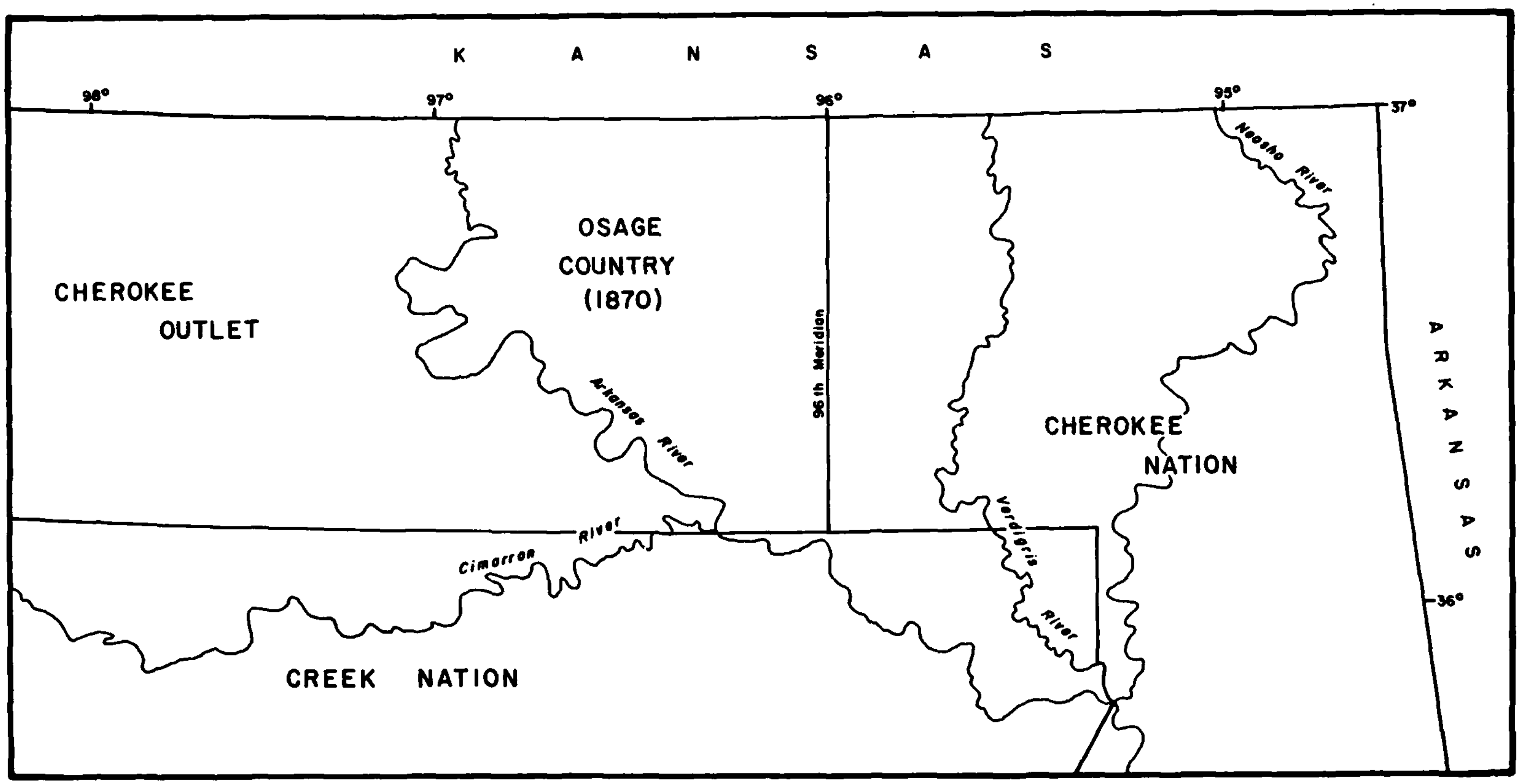


Figure 4-1. Distribution of Indian Lands

operations were still tribal holdings but their fenced fields reduced the size of open tribal lands. Crops grown on the farm were sold to the garrison at Fort Gibson. Anglo education was not quickly accepted in the Creek Nation and hence there were few missions established within its borders. There were a few established to the west but it appears that none were built in the project area itself.

The Creek communities were well established and had a defined pattern of buildings. The center of the village housed the three principal meeting places. These were the chunkey yard, the square, and the chohafa. The square and the chohafa were sites of meetings while the chunkey yard was used as a recreation area. Each town practiced farming in a single field, wherein each individual worked his own land. In regard to marriage, Creek young men and women had some degree of choice, although relatives' permission was required (McReynolds 1956:102).

Trade was important to the Creeks, and being situated on the Arkansas and other rivers helped stimulate their economy. There was some importation of goods from the East and Creek trading posts along the Arkansas River--such as Wealaka, Conchartz, and Choska--thrived. These towns, however, were to the southeast of the project area.

Politically, the Creek Nation was divided into six districts. The Nation had a two-house legislature, whose members were elected by voters for four-year terms. A principal chief was also elected quandrennially. There also existed a national Supreme Court consisting of five justices. A Creek bill of rights guaranteed individual's rights. All treaties were subject to the approval of the legislature.

With the advent of the Civil War, the Creeks were divided over secession. A Creek leader by the name of Opoth le Yahola had gathered

together the Creeks who were supporting the Union. Opoth le Yahola's army was pursued northward into Kansas by a band of Choctaws and Chickasaws under Colonel Douglass H. Cooper. Colonel Cooper, in command of the Indian regiments enlisted in the Confederate army, first found Opoth le Yahola at Round Mountain. The battle took place on November 19, 1861. Both parties retired at nightfall after an indecisive day of fighting. There is some dispute on the actual location of the battle site. Some historians believe evidence which shows that the battle took place in eastern Payne County (Debo 1949:187), while others feel they have proof it took place at the mouth of the Cimarron River, about a mile north of Keystone, which could put the site in the project area (Merserve 1931:447). Brighton (1952:13) believes it occurred on a hill above, and just south of, Old Keystone, and has given this location a site number, Tu-2. Subsequent battles between the two groups led to nothing more than a stand-off.

By May, 1865, the various Indian tribes were resolved to permanent peace, both among themselves and with the Union. By way of a reconstruction treaty, the Creeks ceded the western half of their land to the United States--3,250,000 acres--for $975,168.

The northern border of the triangle between the two rivers was first controlled by the Cherokee Nation. The southern boundary of the Cherokee Outlet passed through the junction of the Cimarron and Arkansas rivers. The Outlet was established in a treaty of 1828. An outlet for the Cherokees had been a promise and policy of the federal government. In 1817, the Cherokees made an "acre for acre" swap whereby the tribe would give up its lands east of the Mississippi River and, in return, would receive an equal amount of land on the Arkansas River. In

1818, President Monroe wrote to the Cherokees, "It is my wish that you may have good mill-seats, plenty of game, and not be surrounded by the white people" (Chapman 1937:32). The boundary between the Outlet and the Cherokee Nation itself was the 96th Meridian, a few miles east of the project area. In 1828, the United States government agreed to grant the Cherokees seven million acres, bounded on the south by the Arkansas River and on the east by the present state line of Arkansas and the southwest corner of Missouri. The Outlet was guaranteed as a perpetual right and it was to extend as far west as the sovereignty of the United States extended. This treaty, however, was not honored.

From the outset the Cherokee Outlet became an object of much controversy concerning its use. The Outlet was a vast expanse of excellent grazing land which appealed strongly to cattlemen who crossed it. It also contained a large acreage that was suitable for wheat and oats as well as other farm crops. After the Civil War the Outlet became part of the trail used by cowboys to drive the great cattle herds north from Texas to Kansas. The large cattle drives were limited to the period 1865-1885. During this time over 6,000,000 head of cattle were driven across the Outlet by way of such trails as the Great Western Trail, the Chisholm Trail, and the West Shawnee Trail (McReynolds 1956:256). The great herds trespassed on Indian land--eating available supplies of grass, knocking down fences, and destroying crops. In the western part of the Outlet, free grazing was unchallenged for years prior to and after the Civil War. Before 1879, there was little organized effort on the part of the Indians to collect for pasturage in the Outlet. Cattlement paid for the right to graze their herds in the Outlet by giving the Indians "gifts" (McReynolds 1956:260). By 1879 the

Cherokees sent agents to the Outlet to collect a fee from each cattleman who grazed his herds there. In 1879 the Cherokees collected just over $1,000 from cattlemen for grazing rights. In 1882 the sum had increased to $41,233 (McReynolds 1956:263). By this time the cattlemen had organized into the Cherokee Strip Live Stock Association. Its leaders decided to bargain with the Cherokee Nation for a lease of the entire Outlet. The Strip Association obtained a charter from the state of Kansas, with the purpose of making a long term lease of the Outlet through an act of the Cherokee Council (McReynolds 1956:263).

The Cherokees were sharply divided over what course of action they should take. Principal Chief Dennis Bushyhead and a small majority of the council supported the idea of leasing the Outlet. On May 19, 1883, an act of the Cherokee Council authorized the contract. The Cherokee Nation was to receive a sum of $100,000 to be paid annually over the next five years in exchange for grazing rights to cattlemen on the Outlet (McReynolds 1956:264). Prior to this agreement the Cherokees had derived little if any benefit from lands in the Outlet west of the Arkansas River (Chapman 1937:219). In 1888 the lease was renewed at $200,000 a year for five more years. This came to about $3.00 an acre. However, an act of Congress on March 2, 1889 opened the Unassigned Lands in Oklahoma, including the Outlet, to white settlers. President Benjamin Harrison declared the Cherokee Strip Live Stock Association lease to be illegal. The Cherokees were given $1.25 an acre for their land. The opening of the Outlet was a stand against ranchers and in favor of farmers (McReynolds 1956:266). The time had passed when large and valuable tracts of land fit for agriculture could be held by Indians for either hunting or grazing purposes. When this act passed Congress, the

Outlet, which had become an important source of income for the Cherokees, was removed from their control (Chapman 1937:225).

A treaty of July 19, 1866 allowed the United States to settle Indians "friendly" to the Cherokees to the west, effectively blocking their outlet (Chapman 1937:202). In June 1872, Cherokee land between the 96th Meridian and the Arkansas River was set aside for the Osage tribal reservation. The Osage tribe had resided in southern Kansas, but in 1870, their land was opened to white settlement. The Federal Indian Office and the Osage agent persuaded the Osage to accept a tract of land west of the Cherokee Nation. The Osage tribe experienced a vast increase in wealth due to the forced sale of their land in Kansas (Debo 1970:177). This move placed two old adversaries side by side. Before 1825, the Osage had occupied this very area. Treaties signed in 1818 and 1825 required the Osage to give up their land in northern Oklahoma and accept a reservation in southern Kansas (Gibson 1978:58). These treaties opened Indian Territory for the removal of the southern tribes. At first, though they had signed removal treaties, the Osage refused to leave the area. With the passage of the Indian Removal Act of 1830, more United States troops were assigned to the area and Osage resistance subsided. However, the relocation of 1872 was basically peaceful, although the Cherokees felt, and rightfully so, that their Outlet to the west was being denied them.

The Osage bought 1,570,196.30 acres of the Outlet at a price of 47.49 cents per acre (Milam 1931:268). Other tribes were also relocated in the Outlet. These included the Kaws, Pawnees, Tonkawas, Poncas, Otos, and the Missourias.

The Osage, a Siouan group, were a more nomadic people than the Creeks or Cherokees. The word Osage is a corruption by the French of the tribal name Wah-Sha-She, meaning Water People (Mathews 1961:68). Upon relocation the tribe did not immediately settle down but went further west into the Outlet in search of buffalo (Finney 1958:420). By the time the Dawes Act was passed in 1887 the Osage had become more sedentary.

The Dawes Act of February 8, 1887 authorized the President of the United States to allot lands in severalty to any Indian tribe. The Act was implemented by the Springer Amendment to the Appropriation Act of March 2, 1889. This clause gave the president authority to negotiate for the purchase of all surplus Indian land west of the Five Civilized Tribes (McReynolds 1956:297).

The Creeks and Cherokees were more advanced agriculturally than the Osage. The two southeastern tribes relied heavily on the cultivation of the soil and the raising of livestock. Creek farms varied from a few acres in size to two and three hundred acres. The Creeks consistently raised a surplus of grain, particularly corn, and they were able to sell this outside the tribe (Graebner 1945:233). Through the last two decades of the 1800s, there was increasing pressure from expanding white populations to gain access to lands in Indian Territory. This was accomplished by various means.

On May 2, 1890, the United States Congress passed an Organic Act for the Territory of Oklahoma. Seven counties were provided by the Act as well as an appointed governor, a secretary, and judges. From this time forward more and more Indian land was subsequently opened up for homesteading by the territorial government.

The Creeks and the other Five Civilized Tribes, as well as the Osage, were initially exempt from allotment in severalty; that is, changing lands under tribal ownership to individual ownership. However, by 1900 the Osage accepted the division of surface land among the 2,229 tribal members. They did manage to retain tribal ownership of their minerals, which allowed them to enjoy financial success through the oil boom in the twentieth century (Debo 1970:257). The Curtis Act of 1898 removed the Five Civilized Tribes from exemption of the Dawes Act. This led to trouble in the Osage reservation.

Allotment of Creek lands, immediately to the south and east of the Osage Nation, began in 1899. This forced ranchers, who had used Creek land for summer pasturage, to find adequate alternatives. They turned to the Osage country. The Osage area was the southernmost extension of the Bluestem Prairie Region, one of the most important ranching areas of the United States (Burrill 1975:204). Ranchers began to flood Osage land to pasture their cattle. To handle this situation, the federal government assumed control over the Osage grazing area. The government prepared a pasture map of the area describing the location, acreage, and range condition of each existing pasture. By this, ranchers could make bids on available land by number. This enabled federal authorities to assume complete control over leasing of pasture land within the Osage reservation (Burrill 1975:211).

Factions grew within the Osage Nation. Conservative fullbloods wanted to resist this pasturage measure, while mixed-bloods saw it as economically advantageous. Bickering between the two groups grew until 1900 when the United States put a stop to it by way of abolishing the Osage government through an order by the Secretary of the Interior (Burrill 1975:205).

On September 16, 1893, the Cherokee Outlet was opened for settlement, which led directly to the establishment of towns in the Keystone area. One hundred thousand settlers took part in the "run."

With the growth of the white population of the area, the new society was characterized by rapid change. Populations, towns, and industries all boomed. For the Creeks and Osage, as well as other tribes, these changes were difficult. The Indian had to compete against the white man in the white man's culture.

Farming and ranching were the vital economic interests of the area before oil was discovered. As previously mentioned, the Creeks and Cherokees had much success in farming and ranching and the Osage were rapidly improving. White settlers also saw the great possibilities of the area. Homesteaders received farms by way of land runs or by lottery. They received 160 acres to establish their homes. Indians on the Osage Reservation were given land allotments in 1906 but there was little surplus land left for whites. Consequently, there was little white settlement north of the Arkansas River in Osage Country (Gibson 1978:163).

Many of the small towns established within the project area and vicinity were there as a result of a growing need for farm supplies. Large ranches sprang up in and near the triangle. An exception was white-owned land in the Osage Reservation, the 60,000 acre "3-D" Ranch. The triangle's northern border, the Arkansas, was the "3-D's" southwestern border. The ranch was located outside Corps property (Stansberry 1966:1). Another ranch, the Miller Ranch, was located near the town of Keystone within the project area (Stansberry 1966:6).

The location of early towns of the area was often chosen by the railroads in a process known as townsite promotion. Townsite enterprises were first adopted by the promoters of new railroads. They were used as either a part of the method of helping finance the road's construction or as a means used by individuals connected with the road for personal gain. There were two methods used by township companies to establish towns. In the first way a company would purchase quarter or half-sections of land, at the place designated by the railroad. The company then platted the land into lots, blocks, and streets, and gave it a name. Then it promoted sale of lots and businesses in town. The second method used was when a township company took options on the land desired and sold the option and townsite rights to individual promoters who would then sell lots.

Following is a list of early settlements in the project area and vicinity and their post offices (see Foreman 1928a-c and Shirk 1948, 1952):

Town	County	Postmaster	Date
Appalachia	Pawnee	?	18 Jan. 1905 to 1 Jan. 1906
Cleveland	Pawnee	Thomas J. Mann	14 April 1894
Gaswell	Creek	John R. Vicars	26 Dec. 1906 to 3 Dec. 1915
Hallett	Pawnee	William D. Oliver	19 May 1905
Jennings	Pawnee	Albert G. McCain	14 Nov. 1893
Keystone	Pawnee	Philander Reeder	26 May 1900 to 12 Oct. 1962
Leroy	Pawnee	Robert L. Jordan	31 May 1894 (discontinued 13 Dec. 1905)
Mannford	Creek	Fred E. Martin	11 April 1903
Osage	Osage	Benjamin M. Evans	10 Jan. 1905
Pemeta	Creek	?	9 Aug. 1915 to 30 Oct. 1923

Town	County	Postmaster	Date
Prue	Osage	Henry Prue (Townsite Owner)	30 Sept. 1905
Sinnett	Pawnee	William P. Sinnett	27 Sept. 1894 (discontinued 14 Dec. 1905)
Terlton	Pawnee	Edward Buchanon	30 Nov. 1894

Some of these "towns," such as Gaswell, were no more than depots along the rail lines. Others were important in the growth of trade and industry in the area. Appalachia and Keystone were established virtually simultaneously in 1893. Keystone was situated on the south side of the Cimarron and Appalachia was just across the river on the north side. The two communities were joined by a precarious, swinging foot-bridge. A spirited rivalry grew up between the towns concerning local saloons. Appalachia claimed to have the better establishments and indeed the saloons on the north side of the river turned a faster profit. The saloon owners in Appalachia--Lee McAfee, a former sheriff from Paris, Texas; and Joe Wierman, a former deputy United States Marshal--consistently sold their liquor for less than the saloons in Keystone. However, Appalachia was cursed by the foot-bridge, and it was dubbed the Carrie Nation Bridge (Morris 1977:112). Clients who lived in Keystone could cross the bridge with little danger while on their way to the saloons, but the return trip was not as easy when one was not sober. The result was that the trip proved too dangerous and soon business for the north-side saloons dropped off. The Appalachia Outlook, which was published by A. J. Snow, soon moved to Keystone and when the St. Louis-San Francisco railroad went through Keystone, it spelled the end of Appalachia. An oil boom in 1905 and several subsequent booms led to

prosperous times for Keystone. However, the oil did not last and by the depression, Keystone's population was shrinking. When the Keystone Dam was built in 1964 the town was inundated (Turner 1937a:419-423). The town of Leroy was four miles northeast of Keystone. It was nothing more than the meeting point of two mail carriers en route from Cleveland and Sapulpa.

Cleveland was an oil town. It was established by the Jordan Valley Town Company on 20 September 1893. A Mr. Dunlap ran a ferry across the Arkansas on the site of the present State Highway #99. In 1904 drilling was started. The wells produced and frenzied building followed. Storage tanks, railroad trackage, pipelines, and roads were built. The population grew from 1,310 in 1910 to 2,717 in 1920 (Morris 1979:68). However, the depression hit Cleveland hard and by 1940 its population was only 2,510. Cleveland has had several weekly newspapers in its history. The Jordan Valley Journal began publication on 5 January 1894. Its editor was E. L. McKee. The Journal was replaced by the Cleveland Bee on January 25, 1895. Its editors were Harve Lester and Harry Sloan. Bridwell Brothers Publishing Company came out with the Cleveland Triangle on 27 July 1899. The Cleveland Enterprise, published by Goodwin and McHenry, advertised two competing brick plants in town. One of these plants could easily be the kiln at the Balmer Homestead (Pw-95) west of Cleveland. The Cleveland Leader replaced the Enterprise as the town's only weekly in 1918, with F. Larkin Woollard as its editor and owner. From the day that William Benbow Hussey surveyed and plotted it, Cleveland has experienced an up and down existence. It remains the largest town in the area, with over 2,500 residents.

The ruins of an old, privately built fort (Pw-119) and the associated buildings in the Cleveland area recall an interesting historic incident. A locally well-known Cherokee was Major John W. Jordan. According to an interview by James H. Fleming with a certain Chal Byers, the Major built a fort one-half mile southeast of Cleveland in about 1880 (Fleming 1939:36). Jordan had been asked by Chief Dennis Bushyhead of the Cherokees to establish residency in the Outlet. He was not to allow any interference from intruders. In short, Jordan was to keep white settlers out (Turner 1939:89). By 1889 the government was aware of Jordan's residence and demanded that he move. Jordan responded that he and his group were residing there "in good faith on Cherokee land" (Chapman 1937:47). The federal government finally took care of the problem by throwing the Outlet open to the public in 1893. The fort was largely destroyed by construction activities associated with Keystone Lake (see Appendix B).

Old Mannford was a thriving community with a bank and "up-to-date stores." The town was named after Thomas Mann, who ran a ferry across the Cimarron. Mannford was moved when the dam was built and now sits above the lake on State Highway #51. Old Mannford was almost entirely inundated (Shirk 1967:135).

The town of Sinnett was located between Cleveland and Keystone, one-half mile south of U.S. Highway #64. It was established one or two days after the "run" of 1893. Messrs. Richard, Lenox, Blackmer, and Lemley had the land surveyed and plotted and sold lots. Mr. Sinnett owned a general store and ran the post office. After the St. Louis-San Francisco Railroad was built through Keystone and Cleveland, Sinnett began to shrink. It experienced no oil boom and soon withered away (Kelly 1939:435).

Both Mannford and Sinnett were agricultural centers. They existed as depots of supplies for the ranchers and farmers in the surrounding area.

Terlton was established at the opening of the Strip in 1893. Mr. Terrel bought a small piece of land and started the promotion of a mine and town. The mine quickly proved of no value and Mr. Terrel left the territory. A townsite company organized and parts of several homesteads were surveyed and platted into a townsite. The lots were subsequently sold and Terlton was established. A general store was set up and soon a post office was added, being run by Edward Buchanon. At the outset, the mail was brought in by stage from Perry. In 1903 the San Francisco Railroad missed Terlton by one-half mile. The townsite company quickly reorganized and bought land from the McElhaney and Hicks homesteads which were nearer the railroad. The old townsite was abandoned and Terlton was moved. J. E. Flores established the first general store in the new townsite and the post office was placed in his store.

In 1913 oil was discovered and the town boomed. Terlton grew to several hundred. A larger school building was built as well as new tank farms to house the oil. The boom lasted only a few years and soon Terlton shrunk, leaving many of its newly built buildings abandoned (Turner 1937b:468-471).

The town of Osage, on the north side of the Arkansas River, was platted by Robert L. Owen in 1894 (Turner 1937c:128). A Mr. Kirkwood circulated a petition to get the town incorporated. This had to prove the town had more than 500 people residing there in order to be eligible

for federal funds to build a school house. Land was sold for two dollars and fifty cents an acre, but few people could pay that. The town raised money through cake sales and sent Mr. Kirkwood to Washington. Through his efforts a Free Home Bill was passed for the town and land became affordable (Turner 1937c:129). Two men, Messrs. Moore and Vandruff, built the first ferry for the town across the Arkansas River, just east of Osage. The two men soon dissolved their partnership and Mr. Moore took complete control of the ferry. However, in 1900, after two years, Mr. Vandruff opened another ferry close by the one run by Mr. Moore. This led to hard feelings and eventually a knife fight between the two. Moore was fatally stabbed. Vandruff's trial was the first murder trial held in what was then Pawnee County (Turner 1937c:130).

Osage was located advantageously. When oil was discovered, the area prospered. Oil was found widespread in the Osage Nation in the early 1900s. A report to the Secretary of the Interior in 1897 reported that there were many indications of oil at places throughout the reservation (Glasscock 1938:130).

Two towns in the triangle, Pemeta and Prue, have left little documentary record. Pemeta, in western Creek County, was located three miles north of Drumright. Nothing remains of Pemeta except the ruins of an oil plant (Cr-85). Prue was a small town on the north bank of the Arkansas, between Osage and Cleveland. It was at least partially inundated by the lake.

During the time of the oil booms there was a tremendous construction of all types of refineries. A Mr. Tom Spradlin, Jr., a retired oil-field laborer, has identified Cr-85 as the remains of a "skimming plant." A

skimming plant was used to skim the oil from the surface of water. This particular plant caught the seepage from oil tanks further upstream on the Cimarron River.

Mr. Spradlin has also revealed that there were two ferries in operation at Oilton. One crossed the Cimarron between Oilton and Jennings on the present site of State Highway #99. Mr. John Wise built and owned it. The second one was south of town and operated until a bridge was constructed across the Cimarron in 1916. This was McMann's Ferry.

The towns of this area were dependent on two things: oil and the railroads. It was a necessity to have both to achieve a growing community. The more successful ones--Cleveland, Osage, and Oilton--are still respectably sized towns but their period of growth had ended by the 1930s.

CHAPTER 5

SOIL-GEOMORPHIC RELATIONSHIPS WITH ARCHEOLOGICAL SITES IN THE KEYSTONE RESERVOIR AREA, OKLAHOMA

General Problem

Visible archeological sites may be dated in many instances by their association with soil-geomorphic patterns. Deep weathering profiles and their associated soils represent periods of stability in earth history. Often soils may be dated by ^{14}C radiometric methods, either by testing their dispersed organic content or by association with organic materials found in a cultural context. The geomorphic surfaces on which weathering profiles and soils are found may be mapped, and suggest localities where archeological sites may be preserved. But geomorphic processes operate continuously under the influence of weather and climate. Slopes and surfaces undergo erosion, and streams meander. As a consequence, geomorphic surfaces and their associated soils may be destroyed by removal, or they may be buried by deposition of sediments. Archeological sites which are found on these surfaces will suffer the same fate.

Three specific questions were addressed in this study, in order to determine the extent to which soil-geomorphic relationships could shed light on the preservation and visibility of archeological sites in the area:

1. How have geomorphic processes affected archeological sites by deposition or erosion of sediment?

a) Deposition obscures sites by burial. Buried soils indicate a period of landscape stability, with subsequent sedimentation burying or obscuring visible archeological sites.

b) Erosion removes evidence of sites. Stable soils with sites may be subsequently lost through meandering of major streams (the Arkansas and Cimarron rivers) and their tributaries.

2. Can soil-geomorphic relationships aid in determining whether sites are restricted to certain time periods?
3. Do paleosols discovered in other valleys in the region occur in the Keystone Reservoir area, and if so, can they be used to determine whether sites in the Keystone Reservoir area may have been buried or obscured?

Geomorphic Background of the Area

The Keystone Reservoir area is underlain by Pennsylvanian sedimentary rock, chiefly sandstones and shales, although siltstones and limestones are also present. These form the backbone of the rolling, hilly landscape, which rises 150 to 200 feet above the major rivers in the south and west, and to 200 to 250 feet of relief in the north and east portions of the reservoir area. The bedrock often crops out in the channels of tributary streams, and may be exposed along the banks of the reservoir itself. Where bedrock is present at or close to the surface we can conclude that slope wash and wave erosion in the reservoir have probably effectively removed most of the evidence of earlier occupation of sites.

Much of the products of erosion of the upland slopes have been deposited in the tributary valleys, and in terrace deposits along the major

streams. Terraces are abandoned floodplains. Floodplains are active geomorphic surfaces formed by the meandering and incision of the streams. Active floodplains will be covered by high water at different recurrent intervals--some each year, some only once in a hundred years. But in any case, the result of stream activity is the same. It is unlikely that archeological sites will be preserved long in floodplain environments.

Terraces thus become the focus for most likely preservation of archeological sites. But terraces are removed by streams meandering and incising in the process of creating their floodplains. Streams in the Keystone Reservoir area are said to be alluviating at the present time. That is, they are building up the levels of their alluvial valleys through deposition of sediment. This deposition will not be universal throughout the area, however, and will be accompanied by erosion as the streams shift their courses, attacking the banks of the terraces. Consequently, even the general condition of stream valley alluviation at the present time will not ensure that many archeological sites have not been lost at some past time through meandering.

Most of the larger tributary valleys of the Arkansas and Cimarron rivers broaden downstream sufficiently to permit terrace deposition and preservation. Characteristically, the tributary valleys narrow quickly upstream, their channels encounter bedrock in their downward incision, and terrace deposits become then or non-existent. The mouths of most tributaries are drowned by high reservoir levels, at which times wave erosion attacks the shoreline and reduces the possibility of preservation of archeological sites. Along the major rivers, terraces elevated above high reservoir levels are virtually non-existent along the Arkansas River but become significant along the Cimarron River two or three miles upstrea

of Oilton. Most archeological sites that have been cited on topographic maps are located above the normal pool elevation of 723 feet, but in the zone that will be washed by wave erosion at high reservoir levels. These are found both along the shores of the major streams' reservoir pool and in the drowned mouths of tributaries. Thus, although normal meandering of the major streams has not been a factor in destruction of archeological sites since closure of the Keystone Dam and filling of the pool, wave erosion during periods of high pool levels has undoubtedly been significant. In addition to removal of evidence of sites by wave erosion, recession of waters from high pool levels also characteristically leaves behind silt layers, which may cover and obscure the sites. Meandering has been somewhat active in certain of the larger tributary valleys, but not to the extent that it would have caused wholesale destruction of archeological sites. Several valleys are discussed in the next section of this report.

Paleosols which represent periods of environmental stability conducive to the preservation of archeological sites have been reported by Hall in the Little Caney River valley (1977a), Hominy Creek valley (1977b), and Birch Creek valley (1977a). These valleys are in the Osage Hills north of the Keystone Reservoir and represent similar environments. Hall's Skiatook paleosol occurs chiefly on upland slopes which are subject to erosion, and is as yet undated. From its description, it may be thousands of years old and is not here considered to be of value in the present problem. This is because of its location in erosional environments where archeological site preservation is rare and because of its uncertain history.

Of greater interest is Hall's Copan paleosol which occurs at the top of an alluvial unit preserved in several sites. This paleosol has been

^{14}C dated at 1300 ± 100 years B.P. and is a useful marker horizon. Hall considers that alluviation occurred after this time, burying the Copan paleosol. This alluviation ceased in the valleys he studied shortly after the advent of white settlements. Recent decades have seen a period of stream incision in the valleys he studied.

Investigations in Tributary Valleys of the Keystone Reservoir Area

Procedure

In order to consider the problem of how soil-geomorphic relationships may aid in the preservation, or conversely, contribute to the loss of visible archeological sites, reconnaisance and detailed investigations were made of several valleys (Fig. 5-1). The steps in the investigation were

1. Field reconnaisance of major tributary valleys to establish the likelihood of the presence of buried soils.
2. Detailed reconnaisance of the most likely candidate valleys in different portions of the Keystone Reservoir area.
3. Description of soil-geomorphic relationships of selected tributary valleys where buried soils were located.
4. A visit to the Copan soil type locality to observe these soils in several soil-geomorphic situations and to ascertain the characteristics of the Copan soil.
5. Leveling of the buried soils of the Scanlon Creek valley to determine how these relate to present reservoir levels in order to determine the likelihood of drowning of the soils or their removal by erosion.

Figure 5-1. Valleys with Buried Soils

Valleys with buried soils deeper than two feet from the present surface:

Tiger Creek	Oilton Quadrangle, Sec. 19
Rock Creek	New Prue quad, Sec. 31
Walnut Creek	New Prue quad, Sec. 25
Sand Creek	Olive quad, Sec. 29
Cottonwood Creek	Olive quad, Sec. 26
House Creek	Terlton quad, Sec. 33
Cowskin Creek	Terlton quad, Sec. 13
South Fork Bear Creek	Terlton quad, Sec. 12
Bear Creek	Terlton quad, Sec. 1
Scanlon Creek	Cleveland quad, Sec. 34

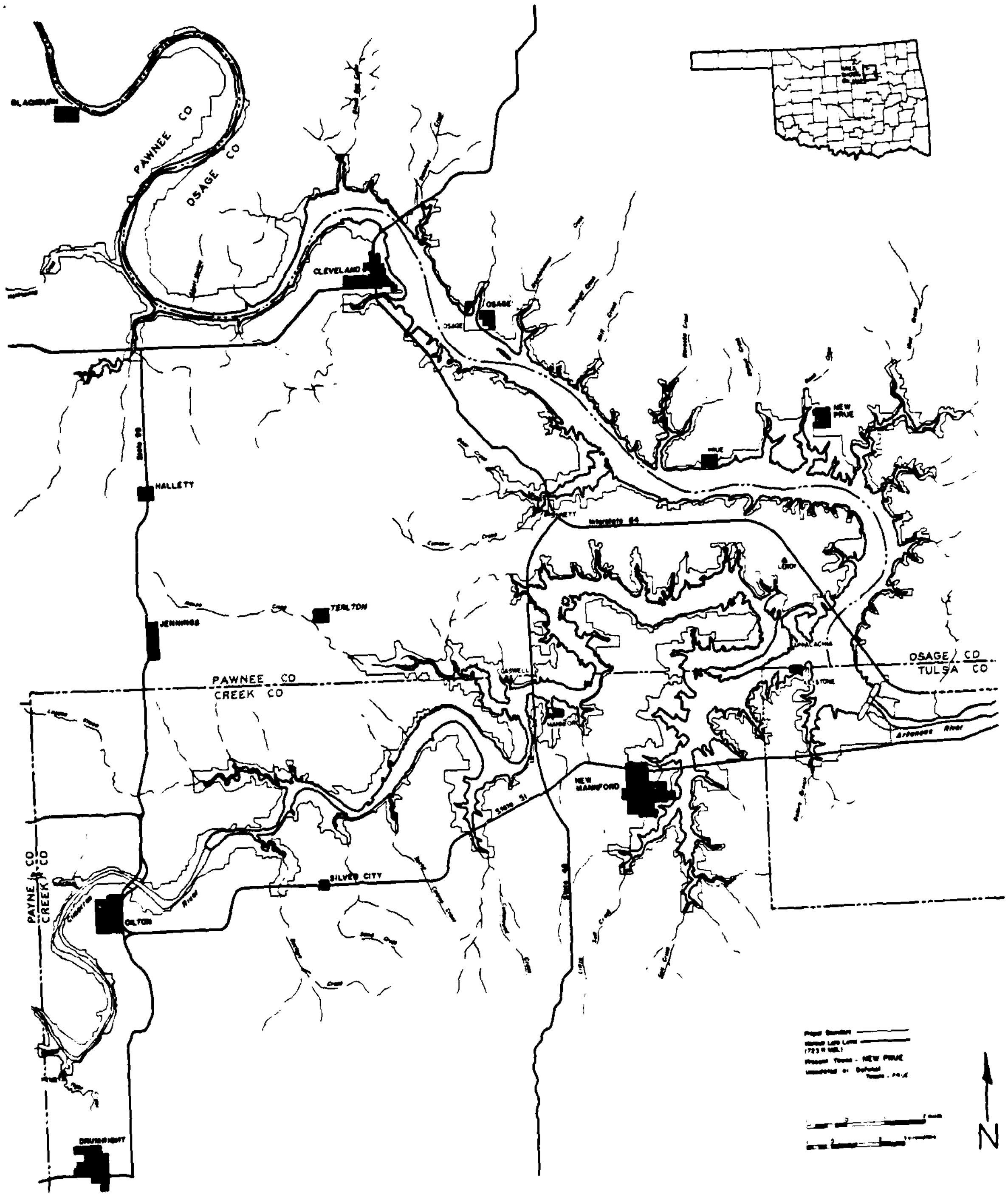


Figure 5-1. Valleys with Buried Soils

6. The establishment of general relationships of depositional and erosional processes for the Keystone Reservoir area as these would affect visible archeological sites.

Valleys with Buried Soils

The following tributary valleys were found to contain buried soils, some of which are believed to correspond to the Copan soil. Soil samples were taken from weathering profiles in three of the valleys, but, unfortunately, none of the laboratories contacted were able to provide ^{14}C dates within the time constraints imposed on this study.

Tiger Creek, Oilton Quadrangle. This is one of the more important sections, because the soil profile (described in detail below) is replicated in the Cimarron River terrace face approximately 200 yards upstream from the mouth of Tiger Creek. This relationship demonstrates that the thick paleosol occurs in terraces of the major valleys as well as the tributaries, but has been obscured by drowning by the reservoir pool downstream. Allowing for differences in alluvium lithology, the buried soil is similar to the Copan soil, both in its character and soil-geomorphic relationship. It is probably formed at the top of the equivalent of Hall's Unit B and is buried by his Unit A sediment. This gives it a probable minimum age of about 1300 radiocarbon years B.P. Thus, archeological sites developed at that time would be covered by Unit A sediments over most of the area. Meandering by the major rivers would eliminate the sites, as probably occurred over much of the area of the major river bottoms before drowning by the reservoir. Archeological sites would be preserved in the Copan-equivalent soil only in tributary valleys where

meandering was not as extensive. Even here Copan-equivalent soils are buried by Unit A sediments and are exposed only where incised relatively recently in geologic time (see descriptions for Rock Creek and Scanlon Creek).

Tiger Creek, Oilton quad. Measured section A, ca. 200 feet from mouth of creek (empties into Cimarron River). Left bank. NE 1/4 NW 1/4 Sec 19 T18N R7E

Depth Below Surface in Feet	Soil colors moist except where noted.
0	Modern A horizon, sandy, relatively structureless, faint evidence of sedimentation layers, lower boundary transitional.
1.2	Possible weak buried soil, 5YR 3/3 (dark reddish brown).
1.3	Unit A, sharp upper break, very firm gritty sand, fine subangular blocky to crumb structure, 2.5YR 3/6 (dark red) lower boundary indistinct.
1.55-2.25	Transitional horizon to buried soil, silty, damp (aquiclude on buried A horizon?) 5 YR 4/6 (yellowish red).
2.4	Buried soil A horizon. Distinct upper boundary, grades indistinctly lighter with depth (drier), upper portion fine subangular blocky to crumb structure, lower portion firm with large peds, 6-8" joint plane spacing. Many burrows, joint planes, and root trails in upper horizon mix colors, 5YR 3/3 (upper), 5YR 3/4 (lower) (dark reddish brown).
4.6	Nearly structureless subsoil, 5YR 3/3 (dark reddish brown).
5.3	Bottom of section, slumped.

Tiger Creek, Oilton quad. Measured section B, right bank, second level above stream with descent

(Continuation of Measured section B, Tiger Creek):

Depth Below Surface in Feet	
	of buried soil on point bar surface, ca. 900 feet from mouth of creek. SE 1/4 SW 1/4 NW 1/4 Sec 19, T18N R7E.
0	Modern A horizon.
1.2-1.3	Unit A, out of reach on cut, appears to have dark red top layer grading to tanner bottom.
3.4	Buried soil A horizon. Very distinct upper boundary, fine crumb structure, 5YR 3/3 (dark reddish brown).
4.5	Buried soil, transitional layer, very firm, nearly structureless, dry, 5YR 4/3 (reddish brown).
5.1-5.4	Buried soil, transition to underlying Unit B sediments, extremely firm, structureless, gritty, 5YR 4/3 (reddish brown).
6.2	Transitional zone to Unit B, very firm, gritty, joint spacing 2-6", dry, 5YR 4/6-4/8 (yellowish red).
7.0	Unit B, very firm, blocky, dry, moistens with depth to slightly mottled zone, 5YR 4/6-4/8 (yellowish red).
9.2	Firm, angular blocky, with numerous small (1-2 mm) black mottles, 2.5YR 4/6 (red), transition to structurless mixed red and yellow sand, 7.5YR 6/8 (reddish yellow) and 2.5YR 4/8 (red).
11.3	Very firm gravel layer, mixed lithology, small rounded pebbles to small subangular flat cobbles (maximum 4"), 0.5-0.6' thick gravel underlain by hard mottled clay-gravel mixture or sandy layer, 2.5YR 3/4 (dark reddish brown). Gravel layer slopes down with surface of buried point bar.
12.8	

<u>Rock Creek, New Prue Quadrangle</u>. While Rock Creek has one of the better exposures of the buried soil (Copan equivalent), the cross-section (Fig. 5-2) is not necessarily typical in that the terrace in which the paleosol is found is cut below the upland surface rather than into older

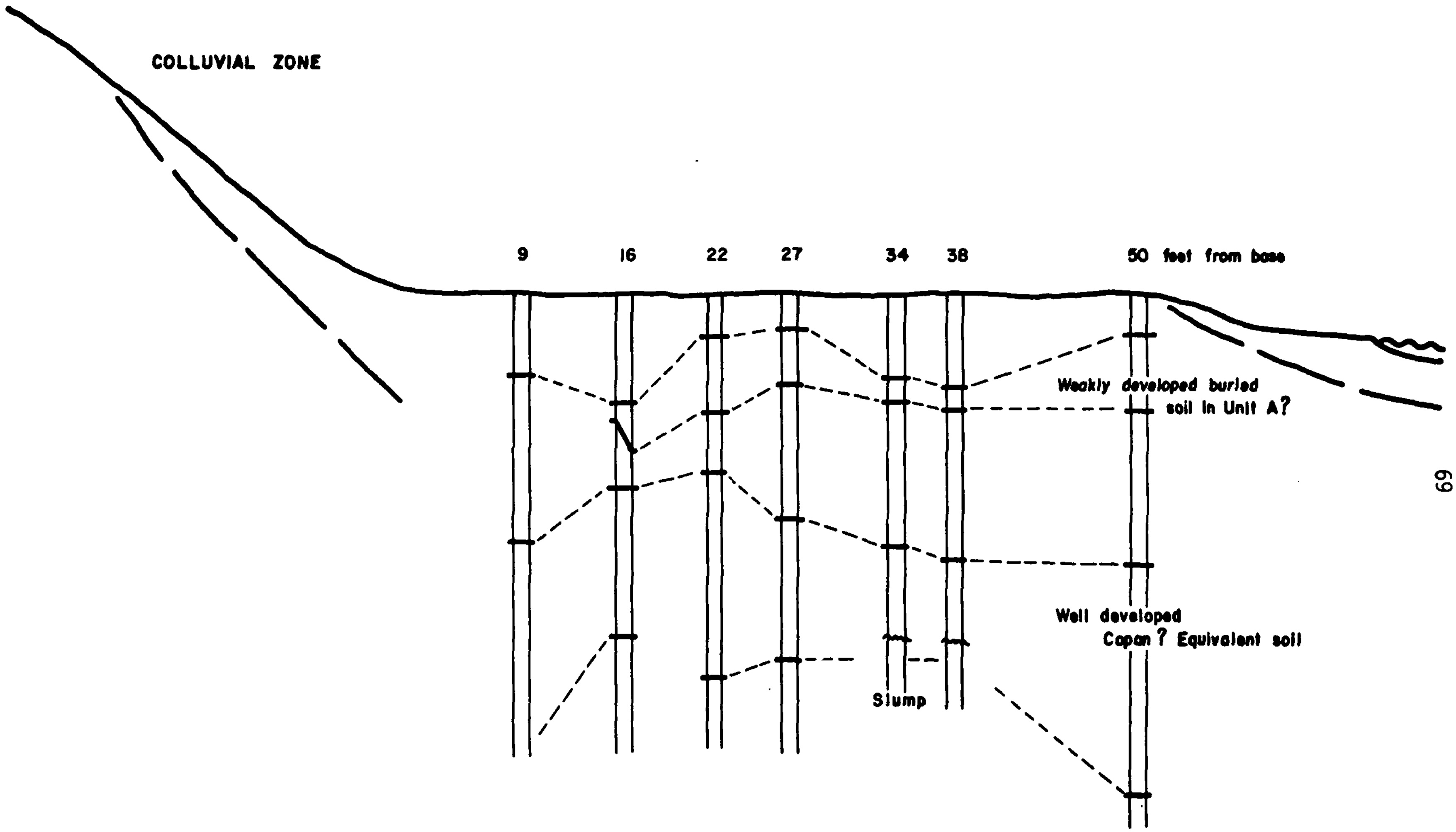


Figure 5-2. Rock Creek Cross Section

and higher terraces. Moreover, the shallowness of the terrace on which the soil is found does not permit description of the underlying Unit B. Unit A sediments are not distinct at this site, possibly because the geomorphic surface is a point bar on a meander, which may indicate relatively recent activity of the stream. Nevertheless, overlying the well-developed Copan-equivalent soil there are indistinct and somewhat discontinuous indications of an upper weakly developed soil layer buried 0.5-2.1 feet below the present surface. The entire soil-geomorphic relationship at this site suggests that in narrow tributary valleys archeological sites may very likely be removed by stream erosion.

Rock Creek, New Prue quad, floodplain cross-section, left bank 50 feet downstream from deep cutbank, colluvial zone at base of upland slopes obscures upland-alluvial fill relationship. NE 1/4 NW 1/4 Sec 31, T21N, R10E.

Depth Below Surface in Feet	Distance from base of colluvium in feet.
0 (9 ft.)	Weak tan layer, indistinct horizons, 10 YR 4/2-3/2 (dark grayish brown to very dary grayish brown).
1.1	Weak upper buried soil, dense mottled lower layer with indistinct transition to stronger buried soil, 10 YR 5/4-3/3 (yellowish brown to dark brown).
3.3-3.5	Buried soil, 10YR 3/2 (dark brown).
(16 ft.)	Measured section, see below.
0 (22 ft.)	Slightly lighter upper layer, darkens with depth to:
0.6	Possible buried soil, diffuse boundaries, 10YR 4/2 (dark grayish brown).

(Continuation of Rock Creek, New Prue quad, floodplain):

Depth Below Surface in Feet	
1.6	Mottled layer, 10YR 4/3 (brown/dark brown) with fain 10YR 3/4 (dark yellowish brown).
2.4	Buried soil, sharp upper boundary, 10YR 2/2 (very dary brown).
5	
0 (27 ft.)	Light surface layer with diffuse lower boundary.
0.5	Upper buried soil, diffuse lower boundary, 10YR 4/2 (dark grayish brown).
1.7-2.0	Lighter layer, 10YR 4/3 (brown/dark brown).
3.0	Buried soil, sharp upper boundary, 10YR 2/2 (very dary brown).
4.8	Slump
0 (34 ft.)	Light surface layer, fairly distinct to 0.4' 10YR 5/4-4/4 (yellowish brown to dark yellowish brown), slightly darker layer to 1.1'.
1.1	Weak upper buried soil, becomes distinctly sandy with depth, mottled with depth, 1.3' 10YR 4/2-3/2 (dark grayish brown to very dark grayish brown), 3.0' 10YR 4/4 (dark yellowish brown).
3.3	Mottled diffuse upper portion of lower buried soil.
3.6	Unmottled lower buried soil, 10YR 2/2 (dark grayish brown).
4.5	Slump
0 (38 ft.)	Light surface layer, darkens with depth, 10YR 4/3 (brown/dark brown).
1.2	Weak supper buried soil, diffuse lower boundary, 10YR 4/3-3/3 (brown/dark brown to dark brown).
1.5	Lighter layer, lightens with depth, 2.2' 10YR 4/4 (dark yellowish brown), 2/8' 10YR 5/6 (yellowish brown).
3.1	Transitional layer to buried soil, mottled.
3.5	Buried soil, strongly mottled.

(Continuation of Rock Creek, New Prue quad, floodplain cross-section):

Depth Below Surface in Feet	
3.7	
	Buried soil, unmottled, 10YR 2/2 (very dark brown).
4.5	
	Slump
0 (50 ft.)	
	Recent sediment, loose sandy clays, darkens with depth.
0.5	
	Darker layer, firmer, suggestion of structure, possible buried soil, 10YR 3/3 (dark brown).
1.5	
	Lighter layer, firm as though slightly cemented with faint dark to reddish brown layer irregular within unit, 10YR 3/4-4/6 (dark yellowish brown).
3.5	
	Lower buried soil, mottled, diffuse upper boundary.
4.0	
	Buried soil, 10YR 2/2 (very dark brown).
6.5	
	MEASURED SECTION, 16 feet from base of colluvium.
0	
	Modern soil, light sand lens 2/10" to 1" thick 2/10' below surface. Clayey sand, structureless, weakly mottled (light brown-medium brown) below 0.4, 10YR 4/2 (dark grayish brown).
1.15	
	Possible weak buried soil, sharp upper boundary, diffuse lower boundary, weak platy structure, lower boundary transitional to weak mottled zone, 1.3' 10YR 4/2 (dark grayish brown), 1.5' mottled 10YR 3/1-4/3 (very dark gray to brown/dark brown).
1.7-2.1	
	Drier, weakly mottled, silty zone, numerous shiny crystals, irregular lower boundary, 10YR 3/2-4/4 (very dark grayish brown to dark yellowish brown).
2.6	
	Buried soil, mottled zone.
3.0	
	Buried soil, unmottled, firm, weak granular structure, 10YR 3/2-3/3 (very dark grayish brown to dark brown).
4.5	
	Slump

Scanlon Creek, Cleveland Quadrangle. This site, although detailed measured sections of weathering profiles were not taken, is typical of several tributary valleys on which buried soils were found. Several terrace levels are present. The oldest and highest terrace (Fig. 5-3) does not contain a buried soil with a distinct A horizon as found in lower terraces. The uppermost terrace sediments may correlate with Hall's Unit C, and the reddish-yellow soil at its surface may be the equivalent of the Skiatook soil. Certainly these are old soils compared with the Copan-equivalent soils on lower terrace levels. This uppermost terrace has been cut and filled back to form the middle or second terrace on which the Copan-equivalent soils are developed. The higher, oldest terrace should be a stable geomorphic surface where it is still present in valley bottoms, and thus would be an excellent landscape in terms of preservation of archeological sites.

The middle or second terrace of Scanlon Creek has a one foot layer of well developed soil buried two to two-and-a-half feet below the surface at the SW 1/4 NW 1/4 SW 1/4 Sec. 34, T22N, R8E. Downstream the buried soil layer is 2.5 feet below the surface and as much as 3.5 feet thick. This is the soil layer which was leveled to the reservoir level (Fig-5-4). It is considered equivalent to the Copan soil. The leveling of the presumed Copan soil layer on Scanlon Creek revealed that the terrace surface on which it is found is less than one meter above the reservoir level. The soil itself forms the shoreline. Thus, at high pool levels this surface will be severely washed by wave erosion resulting in destruction of archeological sites. The numerous site remnants which have been noted on the present and previous archeological surveys may well be a function of this fortuitous juxtaposition in levels of the Copan-equivalent

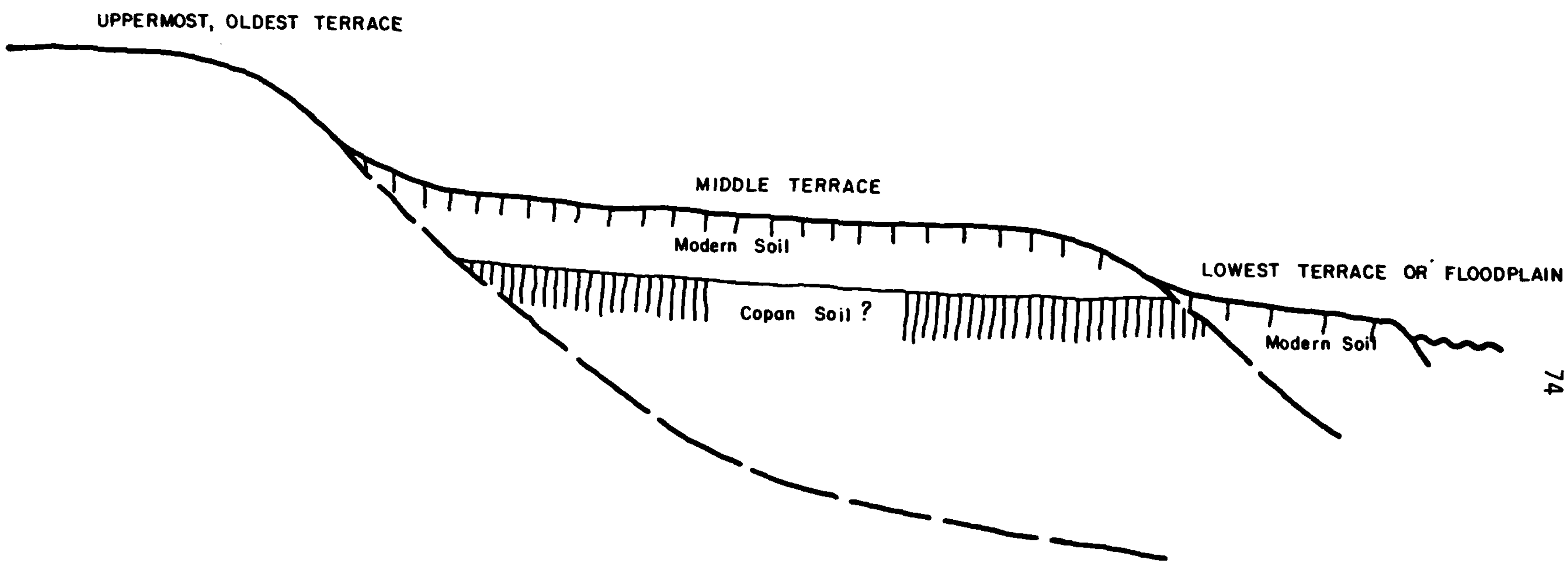


Figure 5-3. Schematic Representation of Typical Valley

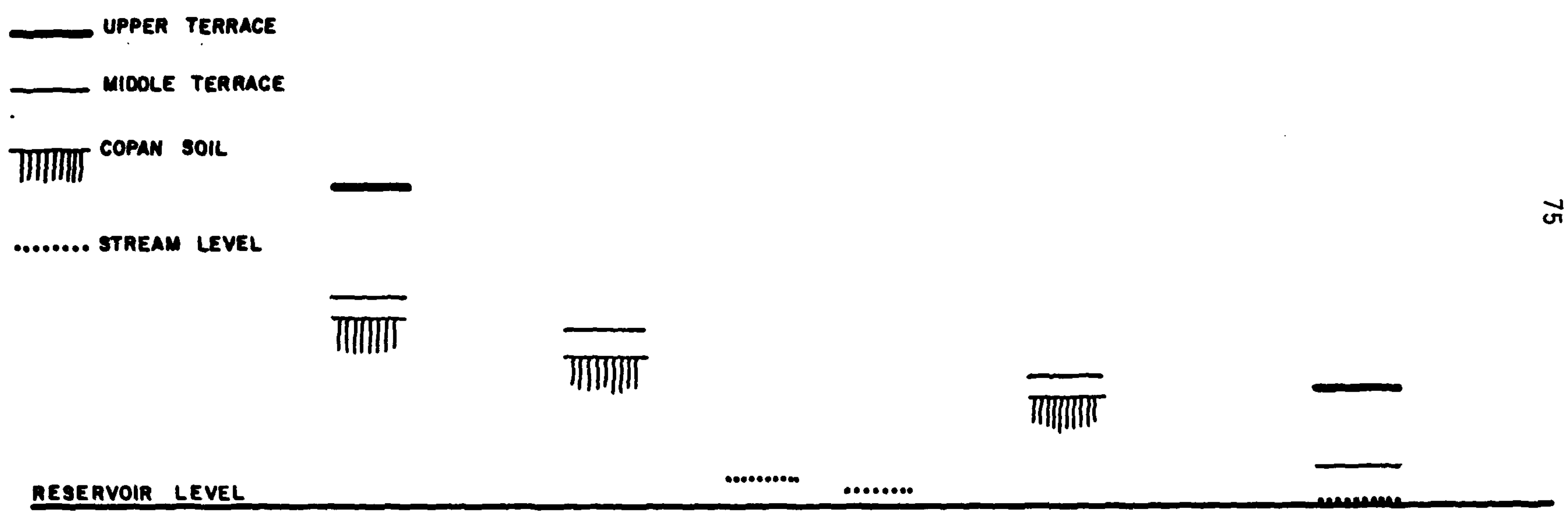


Figure 5-4. Leveling of Soil Profile on Scanlon Creek

soil and the normal low water pool elevation of the reservoir. While washing of the shorelines should reveal new sites at each pool level fluctuation (much as surface wash erosion of hillslopes will reveal newly uncovered geodes and other stone fragments), these sites will soon be removed by continuous wave action, or recovered with sediment if the reservoir remains at a higher level sufficiently long to encourage siltation. Thus, the sites on or in the Copan soils are only temporarily exposed before removal or reburial.

While other valleys have not been leveled, reconnaisance survey suggests a similar relationship obtains in many of them. In places, as at the Walnut Creek recreation area site (Os-365), accretion of alluvial or eolian sands over the buried soil will obscure archeological sites except when they are uncovered by wave erosion. This relationship suggests that resurveys for archeological sites may prove fruitful if timed to follow drops in reservoir levels from high elevations to the normal pool elevation.

Valleys Without Buried Soils

No systematic record was kept of the tributary valleys in which buried soils were not found, because it was felt that more detailed reconnaisance might uncover evidence of former soil-geomorphic surfaces. However, from the valleys which were examined, at least four general causes aid in explaining why evidence of earlier surfaces is lacking:

1. Alluvium in the valleys is too thin, with bedrock too close to the surface to permit preservation of soils, or bedrock forms the surface itself.
2. The appropriate valley flats are drowned by the Keystone or other reservoirs.

3. Man's activities dominate the valley surface, disrupting or destroying evidence of former surfaces. This is particularly true where oil operations are important.
4. Valleys may be dominated by older alluvium without cutting and filling, or redeposition by younger sediments.

Conclusions

To re-examine the original questions addressed in this study:

1a. Deposition will obscure sites in three situations. This first is where Unit A sedimentation, presumably from 1300 years B.P. to perhaps 50-100 years ago, covered the Copan-equivalent soil and any archeological sites found on it. This occurred in any tributary valleys (like Walnut Creek) large enough to develop terrace systems. It also occurred on the terraces of the major rivers (judging from the paleosol on the bank of the Cimarron River upstream of the mouth of Tiger Creek), but virtually all such river terrace sites have been drowned by the reservoir. The second situation is where eolian sands derived from the major rivers' shifting braided channels at low water flows were blown onto adjacent terraces, masking any archeological sites that may have been present. One such site was observed at the Walnut Creek recreation area. This process has been in operation throughout the Holocene, but is less important today because of the drowning of the braided stream channels by the reservoir. The third situation is modern, and relates to siltation during periods of high reservoir pool levels. These silts will obscure archeological sites along the banks only temporarily, because they will be removed by slope wash and wave action when the reservoir level is lowered.

1b. Erosion removes evidence of archeological sites where tributary streams are cutting (or have cut) into the middle terraces where the Copan-equivalent soil is found. Of course, this is a two-edged sword, because recent stream incision is also responsible for exposing the Copan-equivalent soil and perhaps some sites. More critical erosional destruction of sites probably occurs due to the juxtaposition of the level of the Copan-equivalent soil and the normal pool elevation of the reservoir, particularly along the north bank tributaries of the Arkansas River. Along the Cimarron River, at least upstream of Oilton, the Copan-equivalent soil is several feet above stream level and sites would not be lost to erosion in this area.

2. Soil-geomorphic relationships are of some value in determining whether archeological sites are restricted to certain time periods, but further field investigation is necessary before firm conclusions can be drawn for the entire Keystone Reservoir area. At least three distinct terrace levels were identified. The uppermost or oldest terrace is as yet undated and perhaps is undatable in precise terms. The middle terrace presumably contains the Copan-equivalent soil, or a soil which can be dated, whether equivalent to the Copan or not. The lowest terraces or floodplains are more recent and are the most active geomorphologically. Thus, they are least likely to permit preservation of archeological sites.

3. Paleosols discovered in other valleys of the region apparently also occur in the Keystone Reservoir area. Assuming that the widespread well-developed buried soil is equivalent to the Copan soil, the middle terrace may be dated. In any event, the cut-and-fill sequences revealed in the terraces have proved useful in interpreting locations where sites may be buried or obscured, as detailed in previous sections above.

PART II. SURVEY AND TESTING PHASES

CHAPTER 6

RESEARCH DESIGN

This chapter outlines the contract specifications and the additional project-specific research objectives proposed by Archeological Research Associates for the Keystone Lake Project Area. The phases of research are then described.

Contract Specifications

Four of the contract specifications contribute directly to the current effort to locate, describe and evaluate the cultural resources of the Keystone Lake Project Area. They are (1) a literature search for and an evaluation of all previous cultural resource studies relating to the project area; (2) a resurvey of all previously located sites to update an evaluation of their condition and significance; (3) a site survey by foot of the entire land surface of the project area and (4) an evaluation of the condition and significance of all sites discovered during the survey. Evaluations of significance, where potential National Register nominees are concerned, normally require test excavations as a means of determining the areal extent and nature of cultural deposits.

Project-Specific Research Objectives

The conditions in the project area at once present a number of obstacles to and opportunities for archeological research. The obstacles are most apparent and include (1) a skewed population of surface artifacts resulting from exposed scatters being regularly scoured by collectors for

specific classes of artifacts; (2) an artificially-delimited study area conforming to no natural geomorphic or biotic zones or sociocultural regions; (3) a total inundation of all land forms or features (e.g., terraces, stream channels, rockshelters and soil sequences), hydrological features (e.g., springs), lithological resources (e.g., local chert deposits or river gravels), floral resources and evidence of human activity below the maximal 723 foot elevation of the power pool and (4) a physical environment above the power pool greatly modified by agricultural, drilling and construction activities.

Regardless of these obstacles, a number of pertinent problems can be addressed in the project area. Archeological Research Associates proposed (A. Cheek 1979) to investigate five in particular, and to do so often through the use of two or more mutually-exclusive techniques.

Site Age and Cultural Affiliation

Two related problems concern the age and cultural affiliation of prehistoric sites in the project area. Two techniques were proposed to circumvent the predicted paucity of many diagnostic classes of surface artifacts and the inability of field crews to do more than test a few select sites. The first involves the inspection of private collections of artifacts. A concerted effort was to be made to search out the private collections of non-scientist collectors and document temporally or culturally diagnostic artifacts which can be traced to specific sites.

The age of sites which cannot be dated through their surface artifacts may also perhaps be estimated indirectly through dating the paleosols in or on which they are observed. As the initial step toward this end, a geomorphologist was to be commissioned to inspect artifactually dated sites

(there are no radiochemically dated sites in the project area) in or on possible paleosols and to describe these and any other exposed paleosols observed by field crews and the soil sequences in which they are observed.

Activities

Another problem concerns the activities which occurred on site in the project area. The aggregate of the inferred activities serves as the basis for assigning a site to an activity-class (habitation site, seasonal camp, kill site, etc.). Three techniques were proposed. The first is again to draw on private collections for diagnostic artifacts which can be traced to specific sites. The second technique involves the analysis of certain morphological characteristics of the chipped stone observed on sites. This tack may permit inferences about subsistence patterns and trade relationships as well. It was proposed that specific attention should be devoted to material types, to the elements of the reduction sequence which are present, and to the edge types of tools. Because of the predicted size of the site universe (between 150 and 200 sites) and the temporal and financial constraints on the investigation, it was also proposed that a detailed chipped stone analysis should be done for a minimum of 20% of the sites recorded.

A third technique involves the description of the soils and the floral, faunal, lithological and hydrological resources on and around each site. It is assumed that these variables may reflect, at least partially, the activities which occurred on a site. It was proposed to develop a profile of preferred site locations to help construct a model of the prior settlement-subsistence activities in the project area.

Inundated Cultural Resources

It should also be possible to assess, in general terms, the cultural resources inundated by the lake. In the Ft. Gibson Project Area (C. Cheek 1977), it was found that sites tended to occur within a specific range of elevations relative to the river bed. In the lower reaches of the lake where that range was inundated, site frequency decreased. If a similar phenomenon were to be found in the Keystone Lake Project Area, an assessment of the locations of observed sites might perhaps be coupled with information on the pre-inundation topography to increase the accuracy of the estimate of the inundated cultural resources.

Appropriate Regional Sampling Strategy

The occasion of an inventory survey of 100% of the land surface of the project area presents the opportunity to test in an empirical fashion which regional strategy maximizes the discovery of archeological data. What sort of regional strategy is best suited to a survey area, like Keystone, in which a relatively narrow and irregularly shaped land area borders on a body of water? Research into this problem would serve to increase the effectiveness of future research in similar settings in which a sampling program is called for. Thus, it was proposed that following the survey and the plotting of sites on topographic maps, different sampling fractions, unit types (quadrants and transects) and sampling techniques (simple random, stratified, systematic, etc.) should be drawn and their relative utility assessed by comparison to the total universe of sites recorded.

Research Phases

A two-phased field program was designed to accommodate the foregoing

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problems. The first phase had as its goal the survey of 100% of the land surface of the project area giving equal attention to both prehistoric and historic sites. The survey was to be conducted by foot and, where necessary, by boat, and sufficient information was to be collected to complete the Oklahoma State Survey site form. Interviews with collectors were to be conducted concurrently with the site survey, both to locate additional sites and to document diagnostic artifacts, and a five day paleosol survey was to be undertaken at or near the completion of the survey phase.

The goal of the second phase was to systematically select, collect and test a minimum of 20% of the site population. The sample was to consist of a 15% stratified random sample and a 5% non-random sample. Individual sites were then to be collected using randomly and non-randomly located transects and to be tested using randomly and non-randomly located pits.

Surface collecting was reserved until the second phase. The justification of this decision is presented in Chapter 7, but it was believed that time restrictions would not permit individually collected artifacts to be adequately mapped. For the most part, diagnostic artifacts were simply recorded, described if they could not be classified and photographed. Sites with especially significant artifacts could then be included in the non-random component of the testing phase.

The procedural details of each phase and of the subsequent analytical phase are discussed in their respective chapters. Included also are discussions of the difficulties which were encountered in carrying out the plan as proposed and the sometimes considerable deviations which occurred.

Two field phases rather than one were built into the research design for the following reasons. One has to do with the logistics of sampling the site universe, a task which could not be undertaken until after the

site universe had been defined. This clearly necessitated reserving collecting and testing for a subsequent phase. The second reason has to do with priorities, the main one being the completion of the 100% survey--a contract specification. In an area as large, as heavily wooded, as varied in relief and as archeologically unknown as the project area was, it was not clear in the planning stage whether a combined program of survey and testing would prohibit the completion of the former activity. A two-phased program, therefore, was intended to insure that at least the minimal obligations of the contract would be met. Once completed, what, if any, field time was left could safely be devoted to surface collecting and testing.

CHAPTER 7

SITE SURVEY PHASE

A reconnaissance survey of the Keystone Lake Project Area was undertaken for the purposes of (1) locating the prehistoric and historic cultural resources, (2) compiling sufficient data about each site discovered to complete an Oklahoma Archaeological Survey site form, (3) collecting data relevant to specific archeological problems, and (4) relocating previously recorded sites and updating their status. This chapter examines the procedures and results of that site survey.

Procedures

The survey included three complementary activities: an on-foot survey, a boat survey, and informant interviews. In this section the procedural aspects of each activity, along with the gross categories which were distinguished, are described and critiqued.

Cultural Resources

Sites, isolated artifacts, and scatters of fractured rock without obvious artifacts were distinguished and recorded by survey teams. All localities where human activity could confidently be inferred to have occurred were classified as sites. Thus, instances of isolated bedrock mortars or petroglyphs, intact--or once intact--cultural deposits indicated by eroded beach scatters of fire-cracked rock <u>and</u> obvious tools and/or debitage, historic house foundations and even historic trash dumps all were classified as sites. In some instances teams were able

to estimate the areal extent of sites from surface evidence. In other instances site numbers were simply assigned to noticeably distinct concentrations in beach scatters which often extended for hundreds of meters along the shoreline.

Artifacts were classified as "isolated" when less than a total of five were found in a square meter area and/or when an activity loci could not be confidently inferred. Unutilized flakes comprise over 50 percent of the reported instances of isolated artifacts.

Midway into the survey it became apparent that there was a class of phenomena which had not been foreseen. These phenomena consisted of scatters of fractured sandstone or limestone which often gave reddened or mottled appearance of having been burnt, but which lacked the sort of obvious artifactual evidence typical of sites. The scatters were observed on beaches and eroded slopes and were estimated to generally fall within the range of site beach scatters in terms of their areal extent and density.

It is conceivable that individual scatters may be of natural origin or the by-product of prehistoric or recent human activity. Sandstone or limestone outcrops occur in nearly every part of the project area and it has been observed that the thinner strata often break up naturally into fist-sized chunks which the prehistoric occupants of the project area no doubt exploited. (No sandstone or limestone quarries were recognized by the survey teams and there is no reason to predict their existence.) Areas where such chunks have eroded out onto the beach have been observed by the author. Other scatters may be actual sites where few tools were produced or where, by chance, all of the obvious artifacts have been

obscured. Several similar scatters (e.g., Pw-117 and Pw-164) are sites which are known to have been picked clean by collectors. Still other scatters may have eroded out of piles of stone initially removed from the fields by farmers or from oil industry activity. Finally, the mottled red and black color of some of the stone may perhaps be the by-product of natural oxidation, forest fires, recent camp or picnic fires, or oil industry activity.

Owing to the lack of surface evidence to refute any of these alternatives, it was decided to treat the scatters as a separate class of phenomena. They were not assigned State site numbers and none were tested, although such a project is recommended in Chapter 10. The locations of 29 scatters are reported in Appendix F.

At the outset of the survey the intent was to give equal attention to prehistoric and historic sites and *isolated artifacts*. This clearly did not happen, however, for historic phenomena were only selectively recorded. The fault lay in inadequate management of the survey teams and, more importantly, in a common archeological malaise, the failure to accord to historic sites and artifacts equal status as part of the data base for testing archeological models. Historic sites clearly dating to the first two decades of the twentieth century or before were uniformly recorded; recent habitations and farmsteads, though, apparently were not. Oil well sites were not reported though related classes of sites, such as skimming plants and tank barracks, were. Virtually no attention was given to recent limited-activity sites, such as duck blinds, tree platforms constructed by bow and gun hunters, and campfire rings and impromptu picnic areas. Finally, the great quantities of floating and

non-floating debris from the several inundated or partially inundated towns and from past and continued dumping on and around the lake discouraged attempts to record all historic isolated artifacts. Part of the problem was solved by assigning site numbers to the inundated towns and their respective beach scatters. Otherwise, historic artifacts were generally not recorded unless they were concentrated in a dump or if they were isolated and at least 50 years old.

On-Foot Survey

Most of the project area was surveyed on-foot by three or four teams of two or three members each. The minimal equipment carried by each team was a fieldbook, a 30 m tape, a Brunton (or favorably comparable) compass, and the appropriate 7.5 minute USGS topographic map(s). Lacking four 35 mm cameras it was sometimes necessary to return to a site to obtain the obligatory photographs.

The survey began at essentially the eastern extreme of the project area and teams worked their way westward along the Arkansas and the Cimarron. Every attempt was made to survey the whole of the project area, if not every square meter. Prior to each field day sections of the project boundary were transferred from real estate maps (scale: 1:20,000) supplied by the Corps to the appropriate topographic map(s). Each evening the days' progress was plotted on a master map. Every few days the acreage covered was estimated to insure that the pace of the survey was sufficient to complete the project area in the time allotted.

The actual area-by-area coverage varied with the terrain and the extent of the ground cover. Beaches and shoreline, as they tended to be narrow and clear of ground cover, were usually surveyed by teams of two.

Moderately steep, wooded slopes behind the beaches and shoreline were surveyed less thoroughly, though, as they were usually covered with dense grass or a thick mat of humus. Sheet eroded areas and gullies were given special attention, therefore, and the more substantial bedrock outcroppings were inspected above for mortar or "hominy" holes and below for rock art and potential rockshelters.

Larger teams generally surveyed the broader bottomlands and terraces of the primary and secondary drainages and the tableland above the river valleys. Team members systematically cut weaving, but parallel, swaths across each area at intervals of generally less than 20 m. As much as 95 to 99 percent of the ground's surface in these areas was obscured by humus or grass, any exposed soil was examined. Particular attention was given to rodent burrow tailings, dirt roads, gullies, and plowed ground. Systematic shovel test of low visibility areas were ruled out as the time factor simply would not permit this procedure.

For the most part the collecting of artifacts was restricted to the subsequent testing phase. This "no-collection" rule applied to isolated artifacts as well as those found on sites. The decision not to collect during the initial phase was the product of a consideration of William Butler's article (1979) decrying an absolutist no-collection strategy and of several project-specific objectives and demands. The latter were (1) the necessity of completing the daily allotment of 75 acres per man-day or 150 acres per team, (2) the necessary brevity of the visit to each site--a maximum of 30 minutes was recommended, (3) the intent of taking controlled surface collections, and (4) the necessity of allowing sufficient time for the proposed sampling program. Thus, after ruling out

such time consuming techniques as gridding each site and collecting randomly selected squares or flagging and mapping artifacts to be collected, it was decided to note the classes of artifacts on each site, their relative frequencies, and to describe and draw or photograph culturally or temporally diagnostic artifacts or any which team members considered "significant." Sites which were "musts" in terms of being collected could then be nominated for inclusion in the non-random component of the sampling program.

As the survey progressed it became clear, however, that the no-collection rule should not be adhered to absolutely. For one thing, the intensity of the collecting activity initially had been underestimated, and it is clear now that at least "museum quality" and exotic specimens should have been quickly triangulated and collected. The principal example of the failure to do this was an Eva-style projectile point which had been left on a relatively isolated site with the intention of returning to the site during the testing phase. When a team subsequently did return to the site the point was gone; fortunately, it had been photographed. Rapid triangulation and collection of specific artifacts did not begin until late in the survey phase. In still other instances artifacts were retained where sites were being collected as teams were in the process of recording them and where there was knowledge or evidence of repeated and uncontrolled collecting or excavating. Collected artifacts from sites not discussed in Chapter 8 are described in Table 7-1.

Boat Survey

Land surfaces which were not amenable to on-foot survey but which were flanked by the lake were surveyed by a boat crew composed of two

Table 7-1. Artifacts Collected from Sites During the Survey Phase

Site No.	Artifact No.	Description	Notes
Cr-14	1	Projectile point; unknown type; Peoria chert, possibly thermally altered	Fig. 8-4e Table 8-1
Cr-74	1	Ellis-style projectile point; Cotter dolomite	Fig. 8-3f Table 8-1
Cr-75	1	Projectile point; unknown type; Neva chert	Fig. 8-4g Table 8-1
	2	Reed-style projectile point; Keokuk chert	Fig. 8-3l Table 8-1
	3	Edgewood-style projectile point; Keokuk chert	Fig. 8-3e Table 8-1
Cr-76	1	Williams-style projectile point; Kay County chert, thermally altered	Fig. 8-3h Table 8-1
Cr-78	1	Projectile point; unknown type; Kay County chert, thermally altered	Fig. 8-4i Table 8-1
Cr-79	1	Reworked projectile point and/or hafted scraper; Keokuk chert	Fig. 8-5h
	2	Projectile point blade fragment; nondiagnostic; Neva chert	
	3	Gary-style projectile point; Keokuk chert	Fig. 8-3c Table 8-1
	4	Mano, bifacial with a circular pitted zone on each face; sandstone; broken transversely	
Cr-80	1	Knife, triangular and bifacially worked; Shidler chert	Fig. 8-5a
	2	Mano, bifacial with a circular pitted zone on each face; sandstone; broken transversely	
Os-312	1	Ellis-style projectile point; Neva chert	Fig. 8-3g Table 8-1
Os-314	1	Projectile point; unknown type; unifacially worked flake; Neva chert	Fig. 8-4h Table 8-1
Os-362	1	T-drill; length: 7.05 cm, width: 2.30 cm; Keokuk (?) chert	Fig. 8-5i

Table 7-1. (Continued)

Site No.	Artifact No.	Description	Notes
Pw-54	1	Reworked projectile point blade; unknown type; Neva chert	
Pw-92	1	Primary flake, worked unifacially; Kay County chert, thermally altered	
	2	Projectile point; unknown type; Neva chert	Fig. 8-4f Table 8-1
Pw-93	1	Knife, rectangular and bifacially worked; Keokuk chert; broken transversely	Fig. 8-5e
Pw-94	1	Projectile point; unknown type, unknown chert	Fig. 8-4b Table 8-1

individuals. Initially, binoculars were used as an aid to vision, but the water proved too choppy to use them efficiently. The boat employed was a 14 foot keeled outboard.

Typical areas surveyed in this manner included islands, shoreline where the lake met a vertical bluff or a steep, rocky slope, and small coves or beaches which were not easily accessible from a road or blufftop. In instances where a cave or an obvious site was visible from the boat or wherever the setting was potentially right for a site, the crew would put ashore and inspect the area by foot. All islands were surveyed by foot.

Informant Interviews

Interviews were conducted with individuals who possessed some knowledge of the cultural resources of the project area. Most collected artifacts and lived in Tulsa or in one of the towns bordering on the project

area. Names of knowledgeable individuals were acquired from members of the Tulsa Archaeological Society, museum personnel, and from informants themselves. In conjunction with the interviews, pawn shops, curio shops, flea markets, and antique shops in and around Tulsa were visited to determine the nature of the local artifact market. Interviews were originally conceived of as strictly a survey phase activity, but they continued into the subsequent testing, analytical, and writing phases of the project.

Each interview was directed at acquiring five kinds of information. These were: (1) the location of either prehistoric or historic sites, even if they were inundated, (2) the classes of artifacts represented in the informant's collection, (3) from artifacts traceable to specific sites, the age, cultural affiliation, and/or activity-class of discrete sites, (4) the collecting behavior of the informant or of other collectors known to him, and (5) the names of other collectors or knowledgeable individuals who might consent to an interview.

Most of the interviews were conducted by the author in the home of the informant where survey maps and artifacts could be laid out and examined at leisure. Most informants were wary at first--having some notion of the illegality of collecting on public land--but three practices seemed to help break the ice. One practice was to abstain from lecturing collectors or assuming a surly attitude toward them. All of the collectors interviewed had good intentions and, if for no other reason than the obvious practical advantage of continuing an interview, it serves no useful end for the interviewer to demonstrate his own personal feelings about private collections and the manner in which they were acquired.

The second practice was a promise of anonymity. It was made clear at the outset of each interview that two sets of interview notes would

be kept--one private with names and addresses and the other public and coded--and that no informant would be identified by more than a code number in the final report.

The final practice was to structure the interview to the extent that the conversation could eventually turn logically to the "classified" information possessed by the informant. Toward this end, each interview began with polite conversation and a statement about the purpose of the survey, the important role informants could play in the survey, and the nature of the contractual relationship between Archeological Research Associates and the Army Corps of Engineers. (Several informants would not have welcomed Corps employees into their home.) These introductory remarks were followed by an examination of the informant's artifacts. At what seemed the appropriate moment, the informant was asked if he would locate on a map where a particular artifact was found. If the informant responded positively to several such requests, he was then asked point blank if he would locate other sites known to him. Occasionally, appointments were made to visit at a future date sites which the informant could not locate precisely on the map.

It was discovered that some informants were more adept than others at reading and becoming oriented on a topographic map. To alleviate this problem, a simplified map (Department of the Army, n.d.) distributed by the Corps was always used in conjunction with the topographic maps.

Informants were never badgered or pressed for information. However, when it did seem appropriate to do so, they were asked about their own collecting techniques, how long they had been collecting, whether they had excavated, and if they knew of any other collectors who had. Informal notes were taken during the interview and only a mental checkoff list was kept.

There was no attempt to count, describe, or photograph whole collections. Several collections were simply too large; others were too scattered about the house and yard, and all but one (7) lacked an organizational theme which would have facilitated any sort of meaningful analysis. For the most part, description was confined to listing the classes of artifacts and the styles of projectile points present in a collection and to drawing or photographic temporally diagnostic artifacts traceable to located sites.

Each interview was followed soon thereafter by a letter of thanks, gratefully (and honestly) acknowledging the assistance of the informant(s) and trying to answer any unanswered questions about the prehistory of north-central Oklahoma or about artifacts in the collection. Several informants offered to accompany the interviewer in a tour of their sites, but time restrictions permitted only one of these invitations to be accepted.

Informant Contributions

Informants provided a wealth of basic archeological and historical information about the cultural resources of the project area. Inclusion of such information in this report presumes the fundamental integrity of each of the informants. As an independent check, however, historical facts and the existence of individual sites generally are open to test. Verification of the presence of specific types of artifacts may await corroboration through the examination of additional private collections or through additional field work.

Previously Unreported Sites

Sites reported and located by informants number 110. Of these, 76

were previously unreported. The great majority of the latter have prehistoric components.

Of the previously unreported sites, one--a nineteenth century "fort (Pw-119) built to protect a ranching family from Boomer raids emanating out of Kansas--is known to have been obscured by grading during the construction of a levee. Four are known to be permanently inundated. They are a locality (Pw-90) at the mouth of Feyodi Creek where spawning eels were caught historically if not prehistorically, a spring-fed waterfall and pool (Pw-91) which was utilized both prehistorically and historically, a historic Indian cemetery (Pw-133), and a possible Caddoan-affiliated site (Pw-155). (All of the above sites are described in Appendix B.) An additional 45 sites were not found and are thought to be silted over or inundated. Most were reported by a reliable informant (7) who collected the sites when the lake was down. Another 13 sites were not visited because of time restrictions (see Table 10-1).

Unreported Classes of Artifacts

Many classes or varieties of artifacts not unreported by survey teams were found in informant collections. These are listed in Table 7-2 and add to the catalog of artifacts reported for the project area.

Unreported Projectile Point Styles

Many more styles of projectile points were observed in collections than were observed in the field. Points in private collections which conform to accepted, but unreported, styles are listed in Table 7-3. Unfortunately, the great majority of these styles were represented among points found out of context in the gravels below the dam by informants 5a and 5b.

Table 7-2. Artifacts Unique to Informant Collections

beads, bone	hoe, polished stone
beads, fossil crinoid	knife, ground "slate"
beads, historic glass trade variety	knife, Harahey
beads, circular cut shell	knife, tanged stone
boat stone	pipe, T-shaped stone with incised decoration
celts, polished hematite	pipe, historic clay
celts, sandstone	pottery, cord marked
cup, ground and pecked conical-shaped stone	pottery, Crockett Curvilinear Incised
disk, center-drilled ground stone	shaft, abrader, stone
hammer, elk horn	

Table 7-3. Unobserved Projectile Point Styles

Abasalo	Dickson	Pedernales
Agate Basin or Mahaffe	Duncan or McKean	Plainview
Alba	Eden	Redstone
Alberta	Folsom	Rice
Big Sandy	Grand	Rio Grande
Calf Creek	Hanna	Scottsbluff
Clovis (Classic)	Hell Gap	Sequoyah
Clovis (Ross County)	Marcos	Shetley
Cody	Marshall	Smith
Cupp	Maud	Tablerock
Dalton	Meserve	Uvalde
Desmuke or Hamilton	Milnesand	Willowleaf

Unreported Periods and Phases

Two locally rare cultural manifestations were identified as a result of informant interviews. One of these (Pw-89) is a possibly intact Paleo-Indian site of Plainview affiliation. A Plainview point was removed from this site by informants 2a and 2b and a survey team subsequently discovered circumstantially corroborating evidence consisting of two large parallel-sided flakes. These indicate that the occupants of the site were adept at producing flakes of the size required to manufacture a Plainview point (see Appendix B).

Two Caddoan artifacts were discovered on another prehistoric site (Pw-155) by informants 9a and 9b (see Appendix B). One of the artifacts is a T-shaped stone pipe like that illustrated by Bell (1980:Fig. 27a) and the other is a partially intact pottery bowl of Crockett Curvilinear Incised. A similar example of this type is illustrated by James A. Brown (1971:Fig. 10f). Brown (p. 228) suggests that this type was manufactured during the Harlan Phase (A.D. 800-A.D. 1200) at Spiro and at other Caddoan sites in northeast Oklahoma. Unfortunately, this site may be completely inundated (although Pw-92 may be an upland extension) and it may be impossible to determine whether the pipe and the bowl were the product of trade or colonization. They do not appear to be locally manufactured copies.

Isolated Artifacts

Survey teams reported 67 instances of isolated artifacts (Table 7-4). Eighty-five percent of the instances are prehistoric and the majority of these consist of unutilized flakes. Projectile points and a variety of chipped and ground stone artifacts also were reported. Over 50 percent

Table 7-4. Isolated Artifacts from the Keystone Lake Project Area

IA No.	Site No. Assigned	Artifact	Location*	Description
1		Flake	Creekshore	A gray chert
2		Flake	Creekshore	
3		Projectile point	Lakeshore	Gary-style fragment
4		Utilized flake	Creekshore	Blade-like fragment; transverse working edge
5		Flakes (3)	Creekshore	Tertiary
6		Projectile point	Lakeshore	Gary-style fragment
7		Flake	Lakeshore	Tertiary; chert
8		Flake	Creekshore	Secondary or tertiary
9		Historic sherds (3)	Lakeshore	
10		Glass scraper	Lakeshore	Retouched; flawed glass estimated to be old
11		Flake	On abandoned railroad bed	Tertiary; Ogalalla
12		Flake	Lakeshore	Blade fragment; a black chert
13		Flake	Lakeshore	Kay County chert, thermally altered
14		Flakes (2)	Lakeshore	1 tertiary, 1 chip; Kay County chert
15			No. not assigned	
16		Projectile point	Lakeshore	Williams-style; Ogalalla
17-20			Nos. not assigned	
21		Utilized flake	Lakeshore	Side utilization; water worn; a coarse, brownish gray chert

Table 7-4. (Continued)

IA No.	Site No. Assigned	Artifact	Location*	Description
22		Retouched flake	Lakeshore	Worked along one side; Keokuk chert
23		Bedrock groove	Lake edge	Open ended; 15 x 2 cm; man-made (?)
24		Projectile point	Lakeshore bedrock	Fresno-style; Kay County chert, thermally altered; probably placed on bedrock by collector
25		Flakes (2)	Lakeshore	Tertiary; chert
26		Bedrock grooves (3)	Lake edge	In area 10.25 x 3.5 cm; man-made (?)
27		Scraper	Lakeshore	Kay County chert
28		Projectile point	Lakeshore	Contracting-stem fragment
29		Historic trash	Lakeshore	Stoneware and purpled glass
30		No. not assigned		
31		Flake	Lakeshore	Chert
32		Historic sherds (3)	Lakeshore	Decalcomania-style, red flower design; hard paste
33		Fired brick scatter	Lakeshore	
34		Flake	Lakeshore	Tertiary; chert
35		Historic sherd	Lakeshore	Zinc glazed; stoneware
36		Flake	Lakeshore	Tertiary; chert
37		Retouched flake	Lakeshore	Fragment; worked unifacially
38		Flake	Lakeshore	Proximal fragment or chip
39	Pw-93	Flakes (4)	Lakeshore	Tertiary
40		Flake	Lakeshore	Proximal fragment or chip
41	Cr-78	Retouched flake	Lakeshore	Fragment; worked bifacially; Kay County chert
42		Flakes (3)	Lakeshore	Tertiary
43		Preform	Lake edge on rocky slope	Ovoid, 4.3 x 3.1 cm; Keokuk chert

Table 7-4. (Continued)

IA No.	Site No. Assigned	Artifact	Location*	Description
44		Flake	Lakeshore	Tertiary
45		Blanks or scrapers	Creek bank	Tertiary flakes; ovoid, the largest 7 cm in length; Kay County chert, thermally altered
46		Retouched flake	Lakeshore	Fragment
47		Flake	Lakeshore	Tertiary
48	CR-98	Flake	Lakeshore	Tertiary
49		Flakes (2)	Eroding out of bank above lakeshore	Tertiary
50-60			Nos. not assigned	
61		Flake	On upland dirt road	Tertiary
62			No. not assigned	
63		Projectile point	Lakeshore	Non-diagnostic blade fragment
64			No. not assigned	
65		Flake	Upland picnic area	Tertiary
66		Flakes (2)	Lakeshore	Tertiary; 15 m apart
67		Flake	Steep slope above creek	Tertiary
68		Flakes (2)	Lakeshore	Tertiary; 3 m apart
69		Projectile point	On upland foot trail	Non-diagnostic blade fragment
70		Flake	Lakeshore	Tertiary
71	Pw-157	Flakes (2)	Lakeshore	
72	Pw-92	Flakes (3)	Lakeshore	
73		Flakes (3)	Lakeshore	
74			No. not assigned	

Table 7-4. (Continued)

IA No.	Site No. Assigned	Artifact	Location*	Description
75		Flake	Ridge toe	
76		Historic sherds (2)	Lakeshore	1 zinc glazed stoneware, 1 hard paste whiteware
77		Historic sherds (2)	Lakeshore	Hard paste whiteware
78		Bottle glass	Lakeshore	Fragment; purpled
79		Flakes (3)	Lakeshore	
80	Pw-94	Basin metate	Lakeshore	
81-90		Nos. not assigned		
91	Os-340	Retouched flake	Lakeshore	Worked bifacially along one side
92		Flakes (3)	Lakeshore	Tertiary; in 4 m^2 area
93		Flake	Lakeshore	Tertiary
94		Retouched flake	Rocky slope at lake edge	Blade chip, 4 cm in length; worked bifacially along both sides; alternate sides beveled
95		Flake	Lakeshore	Tertiary
96		Projectile point	Lakeshore	Reed-style fragment; Kay County chert, thermally altered
97		Flake	Lakeshore	Proximal fragment or chip
98	Os-315	Petroglyph	Lake edge	Five concentric circles with maximum diameter of 18.50 cm
99		Flakes (2)	On upland dirt road	Tertiary; chert
100		Projectile point	Lakeshore	Scallorn-style fragment
101		Projectile point	Lakeshore	Non-diagnostic fragment
102		Mano	Upland	Fragment; bifacial
103		No. not assigned		

Table 7-4. (Continued)

IA No.	Site No. Assigned	Artifact	Location*	Description
104		Nutting stone	Lakeshore	Fragment, broken transversely through the cup
105		Projectile point	Lakeshore	Dalton-style variant (?) See Fig. 8-4d

*Also see Appendix D.

of the remaining instances of historic artifacts consist of crockery or hard paste ceramics.

Nearly all of the isolated artifacts were found on the open lakeshore and offer no clue as to their origin. The prehistoric artifacts, in particular, are assumed to have eroded out of a soil matrix and onto the beach, but their sources remain a matter of conjecture. Probably most are indicative of a nearby site which is either very small and severely disturbed or upslope and as yet undisturbed or which is severely eroded and the beach scatter below it effectively silted over or inundated. Some of the projectile points may have been lost during a hunt or they may have been carried to the locale by a wounded animal. Historic artifacts probably are indicative of upslope trash dumps or domestic sites.

Sites Analysis

In the course of the site survey and the informant interviews, information was recorded for 270 project area sites, 198 of which have prehistoric components and 83 historic components. These sites are in addition to the 75 sites recorded during previous investigations. Pertinent analytical data for each of the 270 sites are contained in Table 7-5 and the following sites analysis proceeds in a fashion parallel to the information categories of the same table.

Age and Cultural Affiliation

In a survey situation where excavation has not been conducted, site age is normally estimated from classes or styles of artifacts which have been dated on other sites. The strength of the inference is in direct

Table 7-5. Site Data

Site No.	Components	Exposure	Size (m^2)	Elevation	Habitat	Gross Location	Stream Rank	Activity-Type	Activities	Notes
Cr-71*	A-PV	BS	250	725'	4	4	4	C, CV	1,3,7	
Cr-72	P	BS	72 m	725'	1	4	6	C/V	1,3,7	
Cr-73	PV	BS	6,500	725'	1	4	4	C/V	1,3,4,7	See Chapter 8
Cr-74	A or PW	BS	65 m	725'	4	4	4	C/V	1-4,7	
Cr-75	A-PV	BS	3,600	723'	1	3	4	C,CV	1-4,6,7	
Cr-76	A or ePW	BS	100 m	720'	2	4	2	C/V	1,3,4,7	
Cr-77	PV	BS	100 m	725'	4	4	1	C/V	1-4,6,7	
Cr-78	A or PW	BS	350 m	720'	2	4	4	C/V	1-4,7	
Cr-79	P	BS	50 m	723'	2	4	4	C/V	1-4,7,17a	
Cr-80	P	BS	40 m	725'	4	4	2	C/V	1-3,7	
Cr-81	eH	N/I	N/I	N/I	N/I	4	6	V	8,9	See Appendix B
Cr-82	P	PS,RC	1 h	770'	2	4^t	5	C/V	3,4	
Cr-83	1H	S	2.25 h	755'	1	4	4	OR	N/I	
Cr-84	m-1H	S	N/I	753'	1	4	4	Do	8,9	Pemeta; see Ch. 4
Cr-85	m-1H	S	1.2h	765'	2	3^t	6	SP	14	See Chapter 4
Cr-86	1H	S	1,000	740'	1	4	4	V	8,9	3,5
Cr-87	m-1H	N/I	N/I	738'	3	3	1	RD	16	Gaswell; see Ch. 4
Cr-88	P	S,BS	150	723'	1	3	5	C/V	1-3,7	
Cr-89	p	BS	35 m	724'	1	3	5	C/V	1-3,7	

Table 7-5. (Continued)

Site No.	Components	Exposure	Size (m^2)	Elevation	Habitat	Gross Location	Stream Rank	Activity-Type	Activities	Notes
Cr-90	H	S	3 m	755'	1	3	3	I	17	See Appendix B
Cr-91*	P	S	60+	760'	1	3	2	C/V	2,3,12	See Appendix B
Cr-92	P or H	S	5	775'	4	3	6	C	17	Rockshelter, blackened walls
Cr-93	P	S	N/I	800'	4	3	6	C	1,3,7	Rockshelter
Cr-94	P	BS	5 m	724'	2	3	2	C/V	1,3,4,7	
Cr-95	m-1H	S	1,200	732'	2	3	6	Do	9	1(1),2(2),5,7
Cr-96	m-1H	S	121	728'	1	4	3	I	17	1
Cr-97	P	BS	22 m	725'	1	4	2	C/V	1,3,4,7	
Cr-98	P	BS	20 m	728'	1	4	2	C/V	1,3,4,7	
Cr-99	P	BS	20 m	753'	3	4	1	C/V	1,3,7	
Cr-100	P	S	1	730'	4	4	4	C/V	2	Isolated bedrock mortar
Cr-101	m-1H	S	64	730'	4	4	1	Do	9	2
Cr-102	1H	S	260	738'	2	3	2	Do	9	2,5,7
Cr-103	A	BS	25	740'	2	3	1	C	1,3,4,7	
Cr-104	1H	S	2,500	735'	1	3	6	Do	8,9	2
Cr-105	m-1H	S	5,400	730'	2	3	6	Do	8,9	7,10,11
Cr-106	PW or PV	BS	110 m	725'	2	3	4	C/V	1-4,7,172	
Cr-107	PV, e-mH	BS,BS	35 m	735'	2	3	4	C/V,I	3,4,17f	
Cr-108	M-1H	S	2,490	750'	4	3	4	Do	9	1(4)

Table 7-5. (Continued)

Site No.	Components	Exposure	Size (m^2)	Elevation	Habitat	Gross Location	Stream Rank	Activity-Type	Activities	Notes
Cr-109	1H	S	3,000	740'	1	3	4	Do	8,9	1(3),7
Cr-110	P	BS	500	750'	4	3	1	C/V	1-3,7,17a	
Cr-111	m-1H	S	3h	745'	1	3	6	Do	8,9	5,8,9,10
Cr-112	m-1H	s	1,750	725'	1	3	6	Do	8,9	2,7,8,10
Cr-113	1H	S	40	730'	2	3	6	Do	8,9	2,8,10
Cr-114	P	BS	20	730'	4	4	2	C/V	1,3,7	
Cr-115	P	BS	10	730'	4	4	2	C/V	1,3,6,7	
Cr-116	P	BS	N/I	723'	1	4	2	C/V	1,3,4,7	
Cr-117	P	In(?)	N/I	N/I	1	4	2	C/V	10	See Table 10-1
Cr-118	P	RR	?	730'	3	4	6	C/V	3,4	Under old railroad grade
Cr-119	P	BS	6	725'	4	4	1	C/V	1-4,6,7	
Cr-120	1H	S	30	730'	5	4	2	Do	9	2
Cr-121	1H	S	30	730'	5	4	2	I	17	2
Cr-122	1H	S	2,500	735'	5	4	2	Do	9	2,5,7
Cr-123	1H	S	N/I	735'	5	4	2	I	17	2(4)
Cr-124	P	RC	20	730'	4	4	2	C/V	3	
Cr-125	P	BS	50	725'	4	4	1	C/V	4,6	
Cr-126	1H	S	1,600	754'	3	4	2	Do	9	1,7; sandstone block shell intact
Cr-127	PW or PV	BS	2,500	725'	4	4	1	C/V	1,3,4,7	

Table 7-5. (Continued)

Site No.	Compo-nents	Exposure	Size (m^2)	Elevation	Habitat	Habitat Gross Location	Stream Rank	Activity-Type	Activities	Notes
Cr-128	P	In(?)	N/I	N/I	4	4	2	C/V	4,6	See Table 10-1
Cr-129	m-1H	S	500+	723'	2	3	6	Do	9	5,7
Cr-130	P	In(?)	N/I	N/I	2	3	6	C/V	4	See Table 10-1
Cr-131	PV	BS	400	724'	4	4	1	C/V	1,3,4,7	
Cr-132	P	In	N/I	N/I	1	4	4	C/V	2,4,6	
Cr-133	P	S	1	723'	4	4	4	C/V	2	Isolated bedrock mortar
Cr-134	P	BS	5 m	723'	4	4	2	C/V	1,3,7	
Cr-135	P	BS	300 m	723'	4	4	2	C/V	1,3,7	
Cr-136	P	BS	9 m	723'	1	4	2	C/V	1,3,4,7	
Cr-137	P	N/I	N/I	N/I	4	4	1	C/V	3,4	See Table 10-1
Cr-138	P	RC	75 m	740'	5	4	4	C/V	1,3,7	
Cr-139	N/A	S	60	750'	4	4+	1	N/A	N/A	Potential rockshelter site
Cr-140	m-1H	I	N/I	750'	3	4	6	V	8,9	Old Mannford; see Chapter 4
Cr-142	PV	RC	20	740'	1	4	4	C/V	3,4	
Os-309	P,1H	BS,TB	3,750	730'	4	1	2	C/V,TB	1-4,7,14	See Chapter 8
Os-310	P	BS	100 m	724'	2	1	3	C/V	1-4	
Os-311	P	BS	30 m	725'	4	1	1	C/V	1-3,6	
Os-312	A or PW	BS	127 m	724'	1	1	4	C/V	1,3,4,7	
Os-313	P	BS	45 m	725'	1	1	4	C/V	1-4,17a	

Table 7-5. (Continued)

Site No.	Compo-nents	Exposure	Size (m^2)	Elevation	Habitat	Gross Location	Stream Rank	Activity-Type	Activities	Notes
Os-314	P	BS	175 m	725'	1	1	4	C/V	1,3,4,7	
Os-315*	P	S	1	724'	4	1	3	Pt	12	See Appendix B
Os-317	1H	S	6,400	755'	2	1	2	Do	8,9	1(3)
Os-318	m-1H	S,BS	900	723'	2	1	3	Do	9	2,6,10
Os-319	P	BS	24 m	724'	1	1	3	C/V	1,3,7	
Os-320	P	BS	11 m	724'	1	1	3	C/V	1,3,7	
Os-321	P	BS	3m+	723'	4	1	3	C/V	1,3,7	Slopewash into the project area (?)
Os-322*	P	BS	1,600	724'	1	1	3	C/V	1,3,7	See Appendix B
Os-323	P	BS	12 m	724'	1	1	3	C/V	1,3,7	
Os-324	P	BS	92 m	724'	4	1	3	C/V	1-3,7	
Os-325	P	BS	20 m	724'	1	1	3	C/V	1,3,7	
Os-326	P	BS	53 m	724'	4	1	2	C/V	1,3,7	
Os-327	P	BS	96 m	724'	4	1	2	C/V	1,3,7	
Os-328	P,1H	BS,S	47 m	724'	4	1	2	C/V,Do	1,3,7,9	1
Os-329	P,mH	BS	51 m	724'	4	1	1	C/V,I	1,3,7,17f	
Os-330	P	BS	51 m	725'	4	1	1	C/V	1-3,7,10, 17a	
Os-331	P	BS	15 m	723'	1	1	4	C/V	1,7,17a	
Os-332	P	BS	57 m	723'	1	1	4	C/V	1-3,7	
Os-333	P	BS	162 m	724'	2	1	4	C/V	1-3,6-7	

Table 7-5. (Continued)

Site No.	Components	Exposure	Size (m^2)	Elevation	Habitat	Gross Location	Stream Rank	Activity-Type	Activities	Notes
Os-334	P	BS	350 m	725'	1	1	1	C/V	1-3,7,17a	
Os-335	P,m-1H	BS	35 m	723'	4	1	6	C/V,D_p	1,3,7,13	Domestic debris
Os-336	P	BS	1,050	723'	3	1	1	C/V	1-3,7	
Os-337	P	BS	31 m	723'	4	1	3	C/V	1,3,7	
Os-338	P	BS	300 m	725'	2	1	3	C/V	1,3,4,7	
Os-339	P	In(?)	N/I	N/I	2	1	3	C/V	6,17b	See Table 10-1
Os-340	P	BS	75 m	723'	4	1	3	C/V	1-3,7	
Os-341	P	BS	800	724'	1	1	3	C/V	1,3,7	
Os-342	P	RC	1,010	740'	4	1	1	C/V	1-3,7	Oilwell on site
Os-343	A or PW	BS	67 m	723'	1	1	3	C/V	1-4,7	
Os-344	P	BS	35 m	724'	4	1	2	C/V	1,3,7	
Os-345	P	BS	40 m	725'	4	1	3	C/V	1,3,7	
Os-346	P	BS	117 m	725'	2	1	3	C/V	1,3,7	
Os-347	P	BS	30 m	735'	2	1	1	C/V	1,2,7	
Os-348	m-1H	S	90	730'	2	1	1	Do	9	10,12
Os-349	P	N/I	N/I	N/I	2	1	2	C/V	6	See Table 10-1
Os-350	P	BS,RC	875	724'	4	1	2	C/V	1,3,7	
Os-351	P	BS	2,000	745'	3	1	2	C/V	1,3,7	
Os-352	P	In(?)	N/I	N/I	3	1	3	C/V	4	See Table 10-1
Os-353	P	BS	400 m	724'	2	1	3	C/V	1,3,4,6,7	

Table 7-5. (Continued)

Site No.	Compo-nents	Exposure	Size (m^2)	Elevation	Habitat	Gross Location	Stream Rank	Activity-Type	Activities	Notes
Os-354	PV	BS	85 m	725'	2	1	2	C/V	1,3,4,7	
Os-355	P	S	105 m	724'	2	1	1	C/V	1-3,7,17a	
Os-356	A or PW	BS	82 m	724'	2	1	1	C/V	1-4,7,17a	
Os-357	P	BS	35 m	724'	2	1	2	C/V	1,3,7	
Os-358	P	BS	200 m	724'	2	1	2	C/V	1-4,7	
Os-359	e-mH	BS	5 m	724'	2	1	2	I	17f	Fresno point
Os-360	P	BS	100 m	724'	2	1	2	C/V	1-3,7	
Os-361	P	BS	182 m	724'	2	1	2	C/V	1,3,7	
Os-362	A or ePW	BS	100 m	725'	2	1	2	C/V	1-3,6-7	
Os-363	P	In(?)	N/I	N/I	2	1	2	C/V	6,17c	See Table 10-1
Os-364	P	In(?)	N/I	N/I	2	1	3	C/V	4,6	See Table 10-1
Os-365*	A or PW	BS	164 m	724'	2	1	3	C/V	1-4,7,17a	See Appendix B
Os-366	P	BS	30 m	724'	2	1	3	C/V	1-3,7	
Os-367	P	BS	35 m	724'	2	1	3	C/V	1,3,7	
Os-368	1H	S	100	800'	4	1	1	I	17	6; see Appendix B
Os-369	1H	S	9,450	754'	3	1	1	Do	9	1(4),5
Os-370	P	In(?)	N/I	N/I	2	1	3	C/V	6	See Table 10-1
Os-371	P	N/I	N/I	N/I	2	1	1	C/V	2,6	See Table 10-1
Os-372	P	N/I	N/I	N/I	2	1	6	C/V	4,6	See Table 10-1
Os-373	P	N/I	N/I	N/I	2	1	6	C/V	2,4,6	See Table 10-1

Table 7-5. (Continued)

Site No.	Compo-nents	Exposure	Size (m^2)	Elevation	Habitat	Gross Location	Stream Rank	Activity-Type	Activities	Notes
Os-374	P	BS	10+	727'	3	1	6	C/V	1,3,4,6,7	
Os-375	P,m-1H	BS	100	726'	3	1	6	C/V,Do	4,6,9	1,7
Os-376	A or ePW, PV	In(?)	N/I	N/I	2	1	6	C/V	1-4,6,7, 17a,e	See Table 10-1
Os-377	P	BS	50 m	724'	4	1	4	C/V	1-4,6,7, 17a	
Os-378	P,mH	BS	5,625	724'	4	1	4	C/V,I	1,3,4,7, 17f	
Os-379	P	BS	N/I	724'	4	1	4	C/V	3,4,6	See Table 10-1
Os-380	P	N/I	N/I	N/I	4	1	1	C/V	2,4,6,17a	See Table 10-1
Os-381	P	BS	40 m	724'	2	1	2	C/V	1,3,7	
Os-382	P	N/I	N/I	N/I	1	1	2	C/V	3,4,6	See Table 10-1
Os-383	P	N/I	N/I	N/I	2	1+	2	C/V	4	See Table 10-1
Os-384	A or PW	BS	5 m	724'	1	1	2	C/V	1,3,4,7	
Os-385	P	BS	30 m	724'	2	1	2	C/V	1,3,7	
Os-386	P	BS	25 m	724'	4	1	3	C/V	1,3,7	
Os-387	P	BS	30 m	724'	1	1	3	C/V	1,3,7	
Os-388	P	BS	9 m	724'	1	1	3	C/V	1,3,7	
Os-389	P	In(?)	N/I	N/I	4	1	4	C/V	4	See Table 10-1
Os-390	P	In(?)	N/I	N/I	4	1	3	C/V	4	See Table 10-1
Os-391	1H	S	4,560	745'	4	1	3	Do	9	1,5,6(?)

Table 7-5. (Continued)

Site No.	Compo-nents	Exposure	Size (m^2)	Elevation	Habitat	Gross Location	Stream Rank	Activity-Type	Activities	Notes
Os-392	P	N/I	N/I	N/I	4	1	2	C/V	2-4,6	See Table 10-1
Os-393	P	BS	228 m	724'	4	1	4	C/V	1,3,7	
Os-394	P	N/I	N/I	N/I	4	1	4	C/V	2-4,6	See Table 10-1
Os-395	P	BS	40	724'	4	1	4	C/V	1,3,4,6,7	
Os-396	P	BS	25	724'	4	1	3	C/V	1,4,7	
Os-397	m-1H	PF	1,600	750'	2	1	1	I	17f	
Os-398	1H	PF	870	740'	1	1	6	I	17f	
Os-399*	m-1H	S	450	750'	1	1	6	I	17	See Appendix B
Os-400	m-1H	In,S	7.7 h	725'	2	1	6	V	8,9	Prue; see Ch. 4
Os-402	P	BS	107 m	724'	4	1	4	C/V	1-3,7	
Pw-81*	1A or ePW, PV	BS	75 m	723'	2	4	2	C/V	1,3,4,6,7	
Pw-83*	P,eH	BS,S	2,500	725'	4	3	1	C/V,C	1,3,7,11	See Chapter 8
Pw-84	P,H	BS	35 m	725'	2	3	2	C/V,I	1,6,7,17	See Chapter 8
Pw-85	P	BS	150 m	725'	2	3	1	C/V	1-4,6,7	
Pw-86	P	BS	300 m	730'	2	2	6	C/V	1,3,4,6,7	See Chapter 8
Pw-87	P	PC,BS	3,000	725'	3	2	2	C/V	1-4,7	
Pw-88	A or ePW	BS	200 m	725'	3	2	1	C/V	1,3,4,7	
Pw-89*	1PI-eA	BS	350 m	725'	2	3	6	C	1,3,4,7	See Appendix B
Pw-90	P,e-mH	In	N/I	N/I	N/I	2	6	C/V,C	16	See Appendix B

Table 7-5. (Continued)

Site No.	Compo- nents	Exposure	Size (m^2)	Elevation	Habitat	Gross Location	Stream Rank	Activity- Type	Activities	Notes
Pw-91	P,e-1H	In	N/I	N/I	1	3	1	C/V,C	9,17	See Appendix B
Pw-92*	PW	BS	600	730'	2	3	1	C/V	1,3,4,7, 17e	
Pw-93	P	BS	150	723'	2	3	2	C/V	1-4,6,7	
Pw-94*	PV	BS	400 m	725'	2	3	2	C/V	1-4,6,7, 17a,d	
Pw-95*	mH	S	6 m	745'	4	2	2	BK	15	See Appendix B
Pw-96	P	BS	30 m	745'	4	2	2	C/V	1,3,7	
Pw-97	1H	S	5,500	723'	3	3	3	Do	9	2,10
Pw-98	P	BS	150 m	725'	3	3	3	C/V	1,3,6,7	
Pw-99	P	N/I	N/I	N/I	2	3	1	C/V	2,4,6	See Table 10-1
Pw-100	P	BS	150	730'	3	3	1	C/V	1,3,7	
Pw-101	P	In(?)	N/I	N/I	4	3	2	C/V	N/I	See Table 10-1
Pw-102	P	In(?)	N/I	N/I	4	3	6	C/V	4	See Table 10-1
Pw-103	1H	S	1,250	730'	3	3	6	Do	9	1,10
Pw-104*	m-1H	D,S	250	760'	2	3	6	I	17	See Appendix B
Pw-105	1H	S	8,100	760'	2	3^t	1	Do	8,9	2(2),5,7
Pw-106	P	BS	50	728'	3	3	4	C/V	1,3,7	
Pw-107	P	BS	5 m	725'	3	3	4	C/V	1,3,7	
Pw-108	P	BS	5 m	725'	1	3	4	C/V	1,3,7	
Pw-109	P	BS	35 m	725'	1	3	4	C/V	1,3,4,7	

Table 7-5. (Continued)

Site No.	Compo-nents	Exposure	Size (m^2)	Elevation	Habitat	Gross Location	Stream Rank	Activity-Type	Activities	Notes
Pw-110	P	PF	2.4h	730'	1	3	4	C/V	1-3,6,7	
Pw-111	P	BS	100	725	2	4	6	C/V	1,3,7	
Pw-112	P	BS	75 m	725'	2	4	6	C/V	3	
Pw-113	mH	S	2,500	740'	2	4	6	Do	9	2,5
Pw-114	e-mH	S	100	722'	1	4	2	Dp	13	Domestic debris
Pw-115*	PV	BS	2+	725'	2	4	2	Cm	6	See Chapter 8
Pw-116	P	In(?)	N/I	N/I	2	4	1	C/V	4,6	See Table 10-1
Pw-117*	A	BS	N/I	723'	2	4	1	C	1,3,4,7	
Pw-118	P	In(?)	N/I	N/I	2	4	2	C/V	4	See Table 10-1
Pw-119	m-1H	S	N/I	754'	3	2	1	Do	9	See Appendix B
Pw-120	P	BS	20 m	730'	3	2	2	C/V	1,3,4,7	
Pw-121	m-1H	BS,S	120 m	735'	1	2	6	Do	9	
Pw-122	P	BS	50 m	735'	1	2	6	C/V	1,3,7	1(2),7,12
Pw-123	P	In(?)	N/I	N/I	1	2	2	C/V	17	See Table 10-1
Pw-124	P	BS	25 m	730'	1	2	1	C/V	1,3,7	
Pw-125	P	BS	1,000	725'	4	2	1	C/V	1,3,4,7, 17a	
Pw-126	P	BS	100 m	730'	3	2	2	C/V	1-3,7	
Pw-127	P	BS	200 m	725'	3	2	2	C/V	1-3,7	
Pw-128	P,m-1H	BS	80 m	725'	2	2	2	C/V,I	1,2,6,7, 17f	

Table 7-5. (Continued)

Site No.	Components	Exposure	Size (m^2)	Elevation	Habitat	Gross Location	Stream Rank	Activity-Type	Activities	Notes
Pw-129	PW or PV	In	N/I	N/I	3	2	3	C/V	4,6,17e	
Pw-130	P	In(?)	N/I	N/I	3	2	3	C/V	3,4,6	See Table 10-1
Pw-131	1H	BS	150 m	724'	3	2	3	I	17f	
Pw-132	P	In(?)	N/I	N/I	3	2	0	C/V	2,4	See Table 10-1
Pw-133	e-mH	In	N/I	N/I	N/I	3	N/I	Cm	10	See Appendix B
Pw-134*	m-1H	BS	50 m	730'	4	2	1	I	17f	See Appendix B
Pw-135	P	BS	29 m	730'	1	2	6	C/V	1,2,7	
Pw-136	P	BS	20	725'	2	2	6	C/V	3	
Pw-137	P,m-1H	BS	200 m	730'	2	3	6	C/V,I	1,7,17f	
Pw-138	1H	S	225	728'	2	3	1	D_p	13	Domestic debris
Pw-139*	m-1H	BS	75 m	730'	2	3	1	I	17f	See Appendix B
Pw-140	P	In(?)	N/I	N/I	N/I	3	1	I	17	See Table 10-1
Pw-141	P	BS	80 m	726'	2	3	1	C/V	1-3,7	
Pw-142	P	BS	16 m	724'	2	3	1	C/V	1,3,7	
Pw-143	P	BS	40 m	727'	4	3	6	C/V	1,3,7	
Pw-144	P	BS	36 m	724'	2	3	6	C/V	1-3,7	
Pw-145	P	BS	32 m	724'	1	3	6	C/V	1,3,7	
Pw-146	PI	In(?)	N/I	723'	2	3	6	I	17	See Appendix B
Pw-147	P	BS	15 m	724'	2	3	6	C/V	1-3,7	
Pw-148	P	BS	34 m	726'	2	3	6	C/V	1,3,7	

Table 7-5. (Continued)

Site No.	Compo-nents	Exposure	Size (m^2)	Elevation	Habitat	Gross Location	Stream Rank	Activity-Type	Activities	Notes
Pw-149	P	BS	200 m	725'	2	3	6	C/V	1-3,7,17a	
Pw-150	PW or PV	In(?)	N/I	N/I	2	3	1	C/V	4,6	See Table 10-1
Pw-151	P	In(?)	N/I	N/I	2	3	6	C/V	3,4	See Table 10-1
Pw-152	P	In(?)	N/I	N/I	2	3	2	C/V	4,6	See Table 10-1
Pw-153	m-1H	S	2,500	750'	3	3	2	Do	9	2,5,12
Pw-154*	PW or PV	BS	N/I	N/I	3	3	1	C/V	10,17c	See Table 10-1
Pw-155*	PV	In	N/I	N/I	2	3	1	C/V	17d,e	See Appendix B
Pw-156*	m-1H	S	8,800	765'	2	3	1	Do	8,9	See Appendix B
Pw-157*	P	BS	N/I	723'	2	3	2	C/V	6	
Pw-158	P	BS	35	730'	2	3	1	C/V	1,3,7,17a	
Pw-159	1H	BS	30	730'	2	3	1	Dp	13	Domestic debris
Pw-160	P,m-1H	BS	400	725'	2	3	2	C/V,I	1,3,7,17f	
Pw-161	eA	In(?)	N/I	N/I	2	3	1	C	4	See Table 10-1
Pw-162*	A	BS	25	724'	2	3	2	C	1,3,4,7	
Pw-163	P	In(?)	N/I	N/I	3	3	2	C/V	6	See Table 10-1
Pw-164	P	In(?)	N/I	N/I	4	3	2	C/V	2,4,6	See Table 10-1
Pw-165	m-1H	S	2,000	750'	2	3	2	Do	9	2(2),7,13
Pw-166	P	N/I	N/I	N/I	1	3	2	C/V	4,6	See Table 10-1
Pw-167	P	In(?)	N/I	N/I	4	4	6	C/V	2,3,6	See Table 10-1
Pw-168	1H	S	30	730'	3	4	0	Do	9	2(2)

Table 7-5. (Continued)

Site No.	Compo-nents	Exposure	Size (m2)	Elevation	Habitat	Gross Location	Stream Rank	Activity-Type	Activities	Notes
Pw-169	PW or PV	In(?)	N/I	N/I	2	4	6	C/V	4	See Table 10-1
Pw-170	PW or PV	In(?)	N/I	N/I	2	4	1	C/V	2-5,7,10, 17a	See Table 10-1
Pw-171	P	BS	N/I	726'	2	4	1	C/V	1,3,7	
Pw-172	P	BS	25	726'	2	4	1	C/V	1,3,6,7	
Pw-173	m-1H	In	N/I	N/I	1	4	6	V	8,9	Keystone; see Ch. 4
Pw-174	m-1H	In	N/I	N/I	2	3	6	V	8,9	Appalachia, see Ch. 4
Py-51	m-1H	PF	300	765'	3	4	5	I	17f	
Py-52	P	PF	100	760'	2	4	5	C/V	1,3,7	
Tu-23*	PV	S,BS	170+	725'	4	4	1	C/V	1-4,7,10, 17a,e	See Chapter 8
Tu-24	H1	S	1,200	750'	4	4	2	Do	9	See Tu-29, Appendix B
Tu-25	P	In(?)	N/I	N/I	4	4	1	C/V	2,4	See Table 10-1
Tu-26	P	BS	6	724	4	4	2	C/V	3,6	
Tu-27	P	S	1	725'	4	4	2	C/V	2,3	Bedrock mortar and grooves
Tu-28	P	S	1	728'	4	4	2	C/V	2	Bedrock mortar
Tu-29	1H	S	23	840'	4	4	1	Q	7	See Appendix B
Tu-30	m-1H	S	30	850'	4	4	1	Do	9	2
Tu-31	N/I	D	17	830'	4	4	1	I	I	See Appendix B
Tu-32	1H	S	200 m	725'	4	4	7	R	16	Old Keystone Highway
Tu-33	N/A	S	8	830'	4	4	1	N/A	N/A	Potential rockshelter site

Table 7-5. (Continued)

Site No.	Components	Exposure	Size (m^2)	Elevation	Habitat	Gross Location	Stream Rank	Activity-Type	Activities	Notes
Tu-34	1H	S	900	770'	5	4	1	Q	7	See Appendix B
Tu-35	H	D,S	100	750'	4	1	1	I	17	
Tu-36*	m-1H	D,S	900	750'	4	1	1	I	17	See Appendix B
Tu-37	1H	S	39	680'	4	4	1	I	17	2,4; see Appendix B
Tu-38	1H	S	52	740'	2	1	2	Cm	10	See Appendix B
Tu-39	1H	S	6,650	680'	2	1	7	I	17	1(2); trailer pad (?)

Explanation of Table 7-5

Components

PI Paleo-Indian Period (10,000 B.C.-5,000 B.C.)
A Archaic Period (5,000 B.C.-A.D.1)
PW Plains-Woodland Period (A.D.1-A.D.900)
PV Plains Village Period (A.D.900-A.D.1600)
P Interderminant Prehistoric

eH Early Historic (1600s-1880s)
mH Middle Historic (1880s-1920s)
lH Late Historic (1920s-present)
H Interderminant Historic

Exposure

BS Beach Scatters
D Depressions
S Surface Exposures

(Activity-Disturbed Soils)

PC Park Construction
PF Plowed Field
PS Pasture Surface
RC Road Cut
RR Railroad Grade Construction
TB Tank Barracks Site

In Inundated

Size (m^2)

m meters (beach scatters)
h hectares (10,000 m^2)

Habitat

1. Floodplains and Low Terraces
2. Wooded High Terraces and Slopes
3. Grassy High Terraces and Slopes
4. Wooded Stony Uplands
5. Rolling Prairie

Gross Location

1. North of the Arkansas River
2. South of the Arkansas River, on the Triangle
3. North of the Cimarron River, on the Triangle
4. South of the Cimarron River and the Arkansas River below its confluence with the Cimarron River

Stream Rank

0. No stream within 500 meters
1. Wet-weather streams

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6. Cimarron and Arkansas rivers
7. Arkansas River below its confluence with the Cimarron River
8. Keystone Lake

Explanation of Table 7-5 (Continued)

Activity-Type

- BK Brick Kiln
- C Camp
- Cm Cemetery
- C/V Prehistoric Camp or Village
- Do Domestic
- Dp Dump
- OR Oil-Related Facility
- Pt Petroglyph
- Q Quarry
- R Road
- SP Oil Settling Plant
- TB Tank Barracks
- V Historic Village

- I Indeterminate Activity-Type

Activities

1. Cooking
2. Cereal, nut, or raw meat preparation
3. Tool manufacture or repair
4. Hunting
5. Farming
6. Wood, bone, hide, or flesh working
7. Stone quarrying or collecting
8. General subsistence activities (Historic Period)
9. General domestic activities (Historic Period)
10. Inhumation
11. Ritual, social, or recreational painting
12. Ritual, social, or recreational rock carving
13. Dumping
14. Oil production related
15. Brick manufacture
16. Travel related
17. Indeterminate activities
    a. cupstones
    b. "stone disk"
    c. small hematite celts
    d. stone pipes
    e. pottery
    f. domestic debris (Historic Period)

Notes

1. Slab or concrete block foundation
2. Native rock foundation
3. Concrete foundation pillars
4. Dry-laid stone and fire brick
5. Storm cellar
6. Springhouse foundation
7. Well
8. Livestock pen
9. Pond
10. Scattered building rubble
11. Concrete stock tank
12. Cistern
13. Basement

- N/A Not Applicable
- N/I No Information
- * Mitigation proposed in Chapter 14
- t Outside Project Area

proportion to the number of the temporally diagnostic artifacts which are present. Inferences about the cultural affiliation of the occupants of a site are dependent upon essentially the same sort of procedure. Out of necessity the latter are combined into the periods summarized in Chapter 3. Furthermore, given only the "undiagnostic" fire-cracked rock and chipped stone debris which comprised the total visible assemblage of most sites; all that can be inferred from most sites is that they were occupied prehistorically (or perhaps protohistorically) and that the occupants surely were Indian. Where diagnostic artifacts were present, they usually consisted of a single specimen for which the only appropriate inference is that the site was occupied at least as early as the period indicated by the artifact. This sort of inference does not rule out the possibility that the artifact was carried onto the site during a later period.

Provisionally dated prehistoric sites and their diagnostic artifacts are listed in Table 7-6. The table indicates that 34, or 17 percent, of the 198 sites are assignable to one or more periods. The period by period breakdown is as follows:

Paleo-Indian Period or Archaic Period	1
Archaic Period	5
Archaic Period or Plains Woodland Period	14
Plains-Woodland Period	1
Plains-Woodland Period or Plains Village Period	7
Plains Village Period	14

Evidence from at least four sites (Cr-71, Cr-75, Os-376, and Pw-81) suggests the possibility of occupations during more than one period.

Table 7-6. Prehistoric Sites and Their Temporally Diagnostic Artifacts

Site No.	Artifact Source Survey	Artifact Source Informant	Cultural Affiliation	Evidence	Authority
Cr-71		7	eA	Dalton pp.	Perino, ed. (1968:6)
		7	A	Marcos pp.	Perino, ed. (1968:15)
		7	lA	Tablerock pp.	Perino, ed. (1968:26)
		7	A or ePW	Williams pp.	Perino, ed. (1968:26)
		7	A or PW	Ellis pp.	Perino, ed. (1968:8)
		7	PW or PV	Scallorn pp.	Perino, ed. (1968:24)
		7	PV	Fresno pp.	Perino, ed. (1968:9)
		7	PV	Washita pp.	Perino, ed. (1968:27)
Cr-73	X		PW or PV	Scallorn pp.	Perino, ed. (1968:24)
	X		PV	Fresno pp.	Perino, ed. (1968:9)
	X		PV	Reed pp.	Perino, ed. (1968:21)
Cr-74	X		A or PW	Ellis pp.	Perino, ed. (1968:8)
Cr-75	X		A or PW	Edgewood pp.	C. Cheek (1980, personal communication)
	X		PV	Reed pp.	Perino, ed. (1968:21)
	X		PV	Snub-nosed scraper	Young (1978b:292)
Cr-76	X		A or ePW	Williams pp.	Perino, ed. (1968:26)
Cr-78		7	A or PW	Ellis pp.	Perino, ed. (1968:8)
Cr-103	X		A	Eva pp.	Bell (1958:22-23)

Table 7-6. (Continued)

Site No.	Artifact Source Survey	Informant	Cultural Affiliation	Evidence	Authority
Cr-106	X		PW or PV	Scallorn pp.	Perino, ed. (1968:24)
Cr-107	X		PV	Washita pp.	Perino, ed. (1968:27)
Cr-131		10	PV	Shetley pp.	Perino, ed. (1968:25)
Os-22*	X		PW or PV	pottery, undiagnostic	Young (1978a:8-10)
Os-183*		7	PW or PV	"pottery"	Young (1978a:8-10)
Os-312	X		A or PW	Ellis pp.	Perino, ed. (1968:8)
Os-343	X		A or PW	Edgewood pp.	C. Cheek (1980, personal communication)
OS-354	X		PV	Keota pp.	Perino, ed. (1968:14)
Os-356	X		A or PW	Edgewood pp.	C. Cheek (1980, personal communication)
	X		A or ePW	Williams pp.	Perino, ed. (1968:28)
Os-362	X		A or ePW	T-drill, large	Bell (1980:12-14); Larry Neal (1980, personal communication)
Os-365	X		A or PW	Frio pp.	Perino, ed. (1968:9)
Os-376		7	A or ePW	Williams pp.	Perino, ed. (1968:28)
		7	PW or PV	pottery, undiagnostic	Young (1978a:8-10)
		7	PV	Harrell pp.	Perino, ed. (1968:12)

Table 7-6. (Continued)

Site No.	Artifact Source Survey	Artifact Source Informant	Cultural Affiliation	Evidence	Authority
Os-384	X		A or PW	Ellis pp.	Perino, ed. (1968:8)
Pw-10*	X		PW or PV	pottery, undiagnostic	Field Notes
	X		PV	Fresno pp.	Perino, ed. (1968:9)
Pw-11*		7	PV	Harahey Knife	Bell (1980:10-11)
Pw-54*		7	PW	pottery, cord marked with shell temper	Young (1978b:291-292)
			PV	burial with bird bone ornaments	Perino (n.d.:1)
Pw-81		10	1A or PW	boatstone	Bell (1980:49)
		7	PV	Fresno pp.	Perino, ed. (1968:9)
		7	PV	Hurraker pp.	Perino, ed. (1968:13)
Pw-88	X		A or ePW	Williams pp.	Perino, ed. (1968:28)
Pw-89		2a,2b	1PI or eA	Plainview pp.	Perino, ed. (1968:21)
Pw-92		7	PW	pottery, cord marked	Young (1978b:291-292)
Pw-94		10	PV	T-shaped stone pipe	Bell (1980:56-59)
Pw-115	X		PV	Fresno pp.	Perino, ed. (1968:9)
	X		PV	Maud pp.	Perino, ed. (1968:17)

Table 7-6. (Continued)

Site No.	Artifact Source Survey/Informant	Cultural Affiliation	Evidence	Authority
Pw-117	10	A	Tablerock pp.	Perino, ed. (1968:26)
Pw-129	7	PW or PV	"pottery"	Young (1978a:8-10)
Pw-150	6	PW or PV	pottery, undiagnostic	Young (1978a:8-10)
Pw-154	9a,9b	PW or PV	stone hoe, polished	Bell (1980:24-25)
Pw-155	9a,9b	ePV	pottery, Crockett Curvilinear Incised bowl	Brown (1971:228)
	9a,9b	PV	T-shaped stone pipe, incised	Bell (1980:56-59)
Pw-161	10	eA	Dalton pp.	Perino, ed. (1968:6)
Pw-162	10	A	Calf Creek	Perino, ed. (1968:4)
Pw-169	7	PW or PV	"pottery"	Young (1978a:8-10)
Pw-170	7	PW or PV	"pottery"	Young (1978a:8-10)
Tu-23	7	PV	Fresno pp.	Perino, ed. (1968:9)
	7	PV	Reed pp.	Perino, ed. (1968:8)
	7	PW or PV	pottery, undiagnostic	Young (1978a:8-10)

Explanation of Table 7-6

PI Paleo-Indian Period

A Archaic Period

PW Plains-Woodland Period

PV Plains Village Period

e early

m middle

l late

pp projectile point style

* recorded during a previous survey

Turning to the Historic Period sites, all are indicative of American culture, although it is not clear for most whether the personnel were Anglo-European or Indian. Sites were dated and dates were refined by one or more of four techniques: (1) informant knowledge, (2) presence or absence on the 1912 Hominy, Oklahoma quadrangle map (15 minute series), (3) dated artifacts (bottles, bricks, farm machinery, etc.), and (4) the composite age of glass and ceramic debris. The varieties of glass and ceramics which proved useful and their periods of manufacture or popularity are indicated in Figure 7-1.

Three phases are defined on the basis of the "seriated" glass and ceramic varieties of Figure 7-1.

Early Historic:	1600s-1880s
Middle Historic:	1880s-1920s
Late Historic:	1920s-Present

The phases lack any known historical significance and are simply a means of gaining finer temporal control of Historic Period sites. In Table 7-6, the phase designations for dump and non-dump sites must be read differently. The designations for obvious trash dumps (or piles) reflect the temporal range of the artifacts in the deposit, while the designations for non-dump sites--mostly habitation sites--indicate the inferred period of occupation. Diffuse beach scatters without evidence of structures are treated in the same manner as the trash dumps.

The breakdown of Historic Period sites by phases is as follows:

Early Historic	2
Early to Middle Historic	5
Middle Historic	4

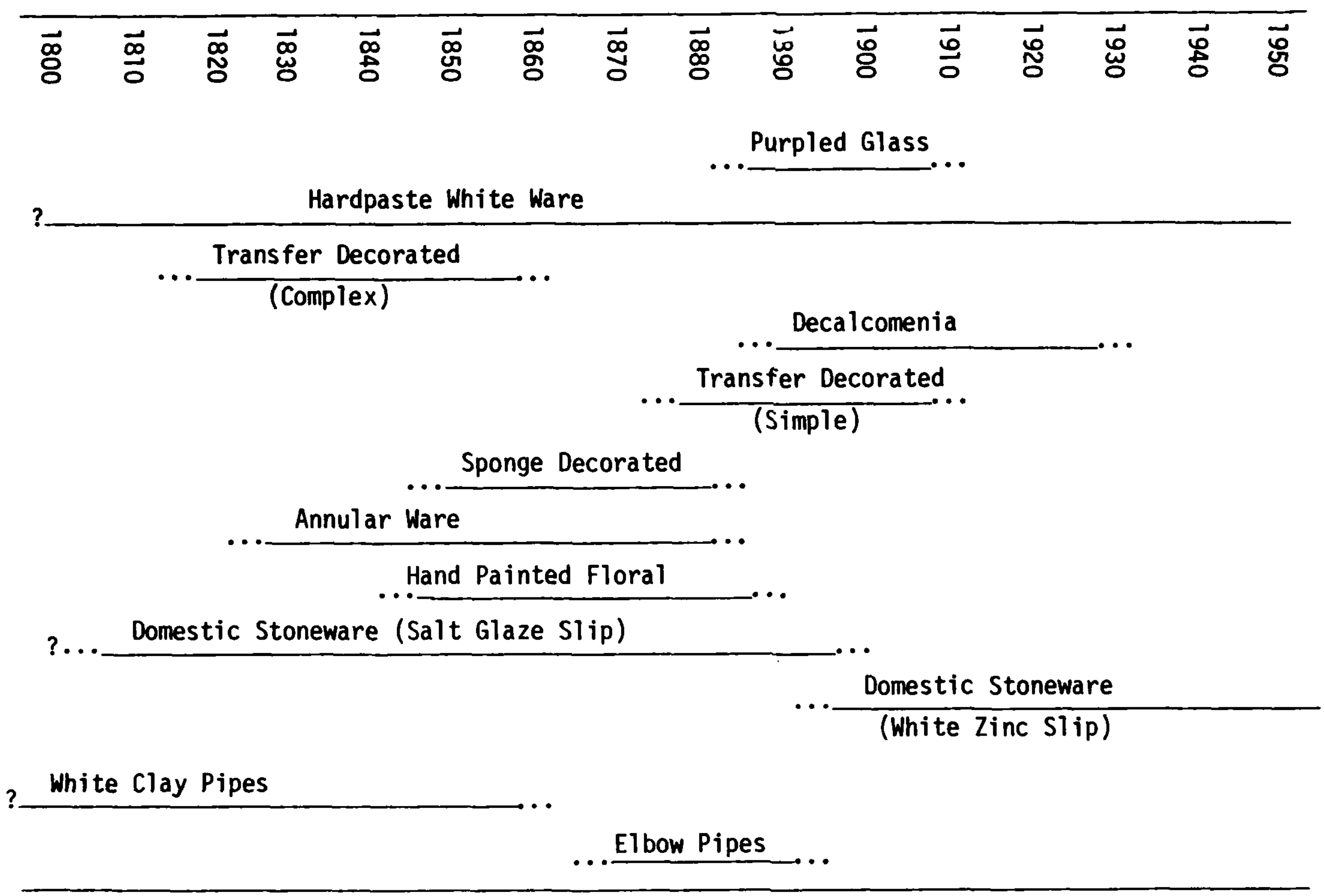

Figure 7-1. Some Temporally Diagnostic Historic Artifacts

Middle to Late Historic	35
Late Historic	31
Early Historic to Late Historic	1

The one site (Pw-91) which spans the phases is reported to have been a spring-fed pool around which wayfarers would camp and local residents picnic (see Appendix B). The remaining five historic components could not be dated.

Exposure

The term "exposure" refers to the physical circumstances in which cultural remains were observed. Seven categories were inferred from the site survey forms. Additional categories contain sites (10) which are known to be inundated, sites (30) which are thought to be inundated or silted over, and sites (14) for which there is no information. Most of the latter sites were reported by informants but were not visited.

Beach Scatters. Fire-cracked rock and chipped and ground stone artifacts which have eroded out of a cultural deposit from a bank or slope and onto a mud or sand beach are classified as beach scatters. At least 156 or 56 percent of the combined prehistoric and historic components fall into this category. By temporal division prehistoric components outnumber historic components 142 to 14. Within the divisions, prehistoric beach scatters comprise 72 percent of all components and the mode, while historic scatters comprise only 22 percent of the observed components.

The significant aspect of beach scatters is that they are not sites at all. They are, rather, the remnants of sites, of cultural deposits

which are being progressively eroded away or which have already been destroyed. All that remains of the site--the artifacts in their soil matrix--lies behind the eroding bank or slope.

While beach scatters are quite similar in their form, they vary considerably in artifact density (Fig. 7-2). Density was estimated by survey teams and the cracked-rock alone probably varies between less than 1 and $10/m^2$ within the area of the scatter. Concentrations of perhaps as much as $50/m^2$ occur in localized portions of sites where features have eroded out of a deposit. Other sorts of artifacts lumped together rarely exceed an estimated density of 1 or $2/m^2$ within the area of the scatter.

Variance of the density within scatters reflects both natural processes and past human acts. The latter have already been touched upon. Dense concentrations in the beach scatter probably are a reflection of dense concentrations in the cultural deposit: Smaller concentrations may indicate particular hearths, while the larger, more diffuse concentrations which are sometimes evident on the larger beach scatters (e.g., Cr-75 and Pw-92 when the lake pool is down) may indicate components or at least more intensively occupied areas of sites which have since eroded away. There are also sometimes lines of fire-cracked rock and artifacts which parallel the waterline (Fig. 7-2a). They are certainly natural, however, and no doubt the result of wave action exposing and concentrating the rock as the lake pool recedes to lower and lower elevations.

<u>Surface Exposures</u>. On 65 sites artifacts or features were observed in essentially pristine circumstances. At least a portion of each site

a. Cr-118

b. Pw-71

c. Os-366

Figure 7-2. Typical Beach Scatters

had been neither eroded nor deflated. Ten of these sites are prehistoric and all are alike in that the undisturbed portions of each site incorporate bedrock or large boulders as a surface for pictographs or soot or as a matrix for mortars, basins, grooves, or petroglyphs. "Undisturbed" sites on soil are confined to the remaining historic sites and comprise the mode for historic sites.

Depressions. Four sites are indicated by one or more obvious depressions of either a circular or rectangular shape. Surface artifacts on three of the sites suggest that the presumably excavated depressions date to the Historic Period. The fourth depression probably also dates to the same period, but there are no artifacts in obvious association with it (see Appendix B, Tu-31).

Activity-Disturbed Soils. Sites were also observed where human activity had disturbed cultural deposits. At least 15 sites of both temporal divisions fall into this category. The circumstances of these disturbances were plowed fields (5), a pasture which had probably once been plowed, and a graded and planted park area; where a tank barracks had been constructed; where service roads cut across shallow deposits (6); and where a railroad grade crossed a site.

Site Size

The area of sites was estimated unless the exposure was limited to a beach scatter or a road cut. The deposits behind beach scatters and surrounding road cuts are uniformly covered with at least 5 cm of overburden, and unless a site was located on a point or cut or bounded by some other natural or artificial feature, it is impossible to estimate the areal

extent of the remaining deposit. With respect to the beach scatters in Table 7-6 which have areal measurements, it is not always clear what was measured. Thus, these estimates are considered less reliable than the linear measurements of the remaining scatters. Time did not permit the remeasurement of these sites.

Beach scatters range in length from 3 m to 400 m. The length of the average scatter is approximately 75 m. Widths of scatters vary with the elevation of the lake pool. At least two sites--Cr-75 and Pw-92--between 30 and 35 m of additional scatter is exposed when the lake pool is three feet below the normal elevation.

Site Distribution

Three independent variables were chosen to test hypotheses about the location and distribution of sites within the project area. The variables are habitat, gross location, and stream rank. Previously reported sites (Table 7-7) located above the top of the power pool (723 feet MSL) were also included in the distribution study. These raise the total number of components analyzed to 336, 251 of which are prehistoric and 85 historic. The locations of all project area sites are illustrated in Figure 7-3 (see attached pocket).

Gross Location. Components were grouped according to their location relative to the Arkansas and Cimarron rivers and to the land masses between which the rivers perhaps acted as barriers. Four classes of sites were differentiated: north of the Arkansas, south of the Arkansas on the triangle, north of the Cimarron on the triangle, and south of the Cimarron and the Arkansas below its confluence with the Cimarron. The distribution of sites by gross location is indicated in Table 7-8.

Table 7-7. Locational Data for Previously Recorded Sites

Site No.	Components	Habitat	Gross Location	Stream Rank
Cr-2	1	1	4	4
Cr-3	2	1	4	2
Cr-4	1	1	4	3
Cr-5	1	1	4	3
Cr-6	1	1	4	6
Cr-7	1	5	4	4
Cr-8	1	2	3	6
Cr-11	1	1	3	5
Cr-13	1	2	3	6
Cr-14	1	2	3	6
Os-6	1	4	1	6
Os-8	1	4	1	3
Os-11	1	2	1	3
Os-12	1	3	1	6
Os-15	1,2	4	1	1
Os-22	1	2	1	2
Os-26	1	2	1	1
Os-183	1	2	1	6
Os-222	1	2	1	2
Os-223	1	2	1	1
Os-224	1	2	1	2
Os-225	1	2	1	2
Os-226	1	2	1	2
Os-227	1	2	1	3
Os-228	1	2	1	2
Os-229	1	2	1	2
Pw-3	1	2	4	1
Pw-4	1	2	4	1
Pw-5	1	3	4	2
Pw-6	1	2	4	6
Pw-7	1	3	3	0

Table 7-7. (Continued)

Site No.	Components	Habitat	Gross Location	Stream Rank
Pw-9	1	1	3	4
Pw-10	1	2	3	6
Pw-11	1	3	3	6
Pw-12	1,2	3	3	6
Pw-15	1	1	2	6
Pw-18	1	3	2	2
Pw-19	1	1	2	2
Pw-21	1	3	2	6
Pw-22	1	3	2	6
Pw-23	1,2	3	2	2
Pw-25	1	2	2	2
Pw-26	1	1	2	2
Pw-28	1,2	3	2	2
Pw-29	1	3	2	2
Pw-31	1	1	3	3
Pw-33	1	1	3	3
Pw-36	1	3	2	3
Pw-41	1	1	2	4
Pw-42	1	3	2	4
Pw-45	1	3	2	6
Pw-46	1	1	2	3
Pw-54	1	2	3	1

Table 7-8. Distribution of Sites by Gross Location

Site Type	Gross Location: North of Arkansas	South of Arkansas	North of Cimarron	South of Cimarron and Arkansas	Total
Prehistoric	95	34	65	57	251
Historic	24	6	29	26	35
Total	119	40	94	83	336

<u>Habitat</u>. The distinctive feature of the five habitats which are defined in this section is that they were derived from descriptions of soils in the project area (Soil Conservation Service 1959a, 1959b, 1977b, 1979). This procedure proved necessary because it must be reemphasized that the lake and prior agricultural and industrial activity have modified the types and distribution of vegetation and masked or modified the topography. For example, what are presently sandy beaches were once high terraces or upland slopes and where once grew oak forest now grow stands of willow or grasses. As the original nature of many land forms could not be determined confidently from the present situation it was decided to at least attempt a provisional reconstruction of the habitat in which each site was located. Thus, the project area soils should afford a reliable indication of the landform on which each site sits and at least a partially reliable indication of the likely pre-lake vegetation surrounding each site.

Soils are known to reflect the parent material out of which they formed, the relief, and the vegetation which they support and also to vary in their fertility and in their general utility (Soil Conservation Service 1979:1<u>ff</u>. or any other county soil survey manuel). The habitats which have been inferred are, to a large extent, those already proposed in Chapter 2: Bottomland, Wooded Upland, and Tall Grass Prairie. The reader is referred to this discussion. The difference is that the five habitats discussed below are intended to be a bit more sensitive to landform, vegetation cover, and soil fertility. While drafting this section a belated discovery was made that the preparers of the Pawnee County Soil Manual (Soil Conservation Service 1959b:48-51) had grouped

their soils and vegetation in exactly the same fashion as is done here. Some lingering misgivings about having strayed from the accepted tripartite system of soil associations and biotic communities have been largely allayed by this discovery. The soil association labels used in the Pawnee County manual have been borrowed intact or have been modified to better suit the purposes of this study. The distribution of sites by habitat is indicated in Table 7-9.

1. Floodplains and Low Terraces. This habitat is found along both rivers and streams. The relief is relatively level and smooth and the varied flora and fauna are those of the Bottomland community. The deep soils are well suited to horticulture, although occasionally they may be flooded for brief periods. The project area soils indicative of this habitat are Barnsdall, Brewer, Choska, Cleora, Dale, Mason, Port, Reinbach, Sandy Alluvial, Verdigris, and Yahola.

2. Wooded High Terraces and Slopes. The relief of this habitat varies as the name implies from relatively level and smooth high terraces to steep slopes. A Wooded Upland floral association dominated by a scrub forest of postoak and blackjack oak with coarse grasses in small clearings typifies this habitat. The soils are comprised of sandy alluvial sediments or eolian deposits. Because these soils are sandy, their productivity ranges from only low to moderate. The project area soils indicative of this habitat are Dougherty, Eufala, Kamie, Konawa, Larton-Glenpool, and Stidham.

3. Grassy High Terraces and Slopes. The relief in this habitat ranges from nearly level and smooth expanses to moderately steep slopes. Prairie grass with scattered oaks, elms, and hickory typifies this habitat. Soils developed in materials of alluvial and eolian origin on

Table 7-9. Distribution of Sites by Habitat

Habitat	1	2	3	4	5	
			Prehistoric			
			North of the Arkansas			
	18	37	10	30	0	95
			South of the Arkansas			
	9	4	18	3	0	34
			North of the Cimarron			
	14	34	9	8	0	65
			South of the Cimarron and the Arkansas			
	14	16	3	23	1	57
Subtotal	55	91	40	64	1	251
			Historic			
			North of the Arkansas			
	5	7	2	10	0	24
			South of the Arkansas			
	1	1	2	2	0	6
			North of the Cimarron			
	9	14	4	2	0	29
			South of the Cimarron and the Arkansas			
	9	2	3	7	5	26
Subtotal	24	24	11	21	5	85
Total	79	115	51	85	6	336

high terraces and slopes above the rivers and creeks are moderately to highly productive. The soils indicative of this habitat are Minco, Norge, Teller, and Vanoss.

4. Wooded Stony Uplands. The relief of this habitat ranges from sloping valley walls to ridge tops, to rolling to hilly areas. Bedrock outcrops are a common occurrence. A Wooded Upland floral association dominated by a scrub forest of postoak and blackjack oak with coarse grasses in small clearings typifies this habitat. Soils are shallow and stony, sometimes sandy, and range from unproductive to moderately productive. The project area soils indicative of this habitat are Darnell-Stephenville, Niotaze- Darnell, Pottsville, and Talahina.

5. Rolling Prairie. This habitat is found in the uplands on the gently sloping to steeply sloping sides of valleys and on the nearly level floors of shallow valleys. The flora and the fauna are those of the Tall Grass Prairie community. These soils are moderately productive to productive when broken up by the steel-tipped plow. The project area soils indicative of this habitat are Bates, Dennis, and Okemah.

Just how far these habitats and their present boundaries can be projected into the past is touched upon in Chapter 2. Henry's (1968) palynological findings in the Hominy Creek Valley to the northeast indicates that there have been no major biotic changes or fluctuations during the past two millenia. Thus, it is probably safe to assume that the habitats can be projected backward into early Plains-Woodland times at least. However, the corollary assumption that the habitats had the same boundaries is probably not justified given that climatic fluctuations may cause one biotic community to expand into another along their ecotone

(Chapter 2). Palynological studies at selected sites might provide some clarifying data on this problem.

Stream Rank. Sites were also grouped by stream rank, following the technique advocated by David and Margaret Weide (1973) in which streams are ranked from the head of a drainage. Each site was assigned the rank of the nearest stream as determined from the appropriate topographic map. The rank of tributary streams of the Arkansas and the Cimarron ranged from 1 to 5, 1 most often being a "finger-tip" channel or wet-weather stream which is normally dry (see Strahler 1952:1120) and 5 being a substantial stream flanked by a broad floodplain. The Arkansas and the Cimarron were assigned arbitrary ranks of 6--as they probably are formed of streams outside the project area which rank higher than 5--and the Arkansas below its confluence with the Cimarron was assigned a rank of 7. Sites which had no stream within 500 m were assigned a rank of 0 and those whose closest apparent water source was Keystone Lake (Sections 25 and 26, T. 20 N., R. 10 E., Keystone Dam (Quadrangle) were assigned a rank of 8. The distribution of sites by stream rank is indicated in Table 7-10.

Analysis. With respect to the location and distribution of project area sites, three problems were posed: From a management standpoint how are the sites distributed? Do prehistoric and historic sites differ in their distributions?, and What locational tendencies are indicated by the distributions of prehistoric and historic sites, respectively? The initial question may be answered most easily. Unfortunately, the available time and funds did not permit the land acreage of each gross geographic locality to be calculated, thus the following remarks are phrased in terms of site percentages rather than the more useful site density.

Table 7-10. Distribution of Sites by Stream Rank

	0	1	2	3	4	5	6	7	8	
Prehistoric										
North of the Arkansas										
	0	14	27	31	14	0	9	0	0	95
South of the Arkansas										
	1	4	14	5	2	0	8	0	0	34
North of the Cimarron										
	1	14	13	3	8	3	19	0	4	65
South of the Cimarron and the Arkansas										
	0	16	20	2	11	0	8	0	0	57
Subtotal	2	48	74	41	35	3	44	0	4	251
Historic										
North of the Arkansas										
	0	8	4	4	2	0	4	1	0	24
South of the Arkansas										
	0	1	3	1	0	0	1	0	0	6
North of the Cimarron										
	0	4	4	2	5	0	12	0	2	29
South of the Cimarron and the Arkansas										
	1	6	8	1	2	3	4	1	0	26
Subtotal	1	19	20	8	9	3	21	2	2	85

Considering prehistoric and historic sites together, the greatest numbers are found north of the Arkansas River (35%), in the Wooded High Terraces and Slopes habitat (34%), and within 500 m of a second order stream (28%). When prehistoric and historic sites are considered separately, the greatest divergence from the preceding "pattern" is evident in the distribution of historic sites. They are distributed rather evenly across all of the gross localities but one (south of the Arkansas) and three of the five habitats (Grassy High Terraces and Rolling Prairie are the exceptions), and 70% of the sites are rather evenly distributed among three of the stream orders (1, 2, and 6). Generalizations about the distribution of the prehistoric sites must necessarily be preceded by the caveat that a large percentage of the sites were only observed as beach scatters. The number of additional buried sites overlooked is uncertain. However, the reported sites have the same overall distribution as prehistoric and historic sites considered together and differ in percentages in being one point higher on the average for each variable.

With respect to the second and third problems a series of hypotheses concerning the effects of the locational variables on site distribution was posed and then tested in two separate and contrasting runs by means of the chi-square statistic. Chi-square provides a means of evaluating "whether or not frequencies which have been empirically obtained differ significantly from those which would be expected under a certain set of theoretical assumptions" (Blalock 1969:212; also see pp. 212ff). The alpha-level to reject the null hypothesis of a significant difference between the frequencies was set arbitrarily at .05. To facilitate the analysis the Rolling Prairie habitat was excluded because there were only

six instances in the sample and stream ranks 0, 1, and 8 were combined in the first run, as were 4 and 5 and 6 and 7, respectively. This was done to reduce the likelihood that the results of individual tests would have to be discarded because of too many empty cells in the contingency table or too many expected values less than five (see Thomas 1976:298). As will be indicated below, this attempt was largely unsuccessful. The stream ranks were not combined in the second run.

Turning to the second problem, hypotheses were posed which stated that the distributions of prehistoric and historic sites were differentially affected by habitat, gross location, and stream rank, respectively. Subsequently, tests were run to determine if the distributions were differentially affected when stream rank was controlled for habitat and then gross location, when habitat was controlled for stream rank and then gross location, and when gross location was controlled for stream rank and then habitat. Unfortunately, 74% of the first run tests were discarded, as were 92% of the second run tests. Of the remainder, none of the null hypotheses predicting no significant difference in the effect of the variables could be rejected. Thus, all that can be said with any assurity about the differential distribution of prehistoric and historic sites is that there is no significant difference in the effects of:

1. Gross location.
2. Habitat.
3. The combined stream ranks (Run No. 1).
4. Gross location when the Bottomland habitat is controlled for.
5. The combined stream ranks when the Wooded High Terraces and Slopes habitat is controlled for.

6. The combined stream ranks when the gross location north of the Arkansas is controlled for.

Contrasting results were obtained in the first run tests when the site type was controlled for. The null hypothesis was rejected when the chi square statistic was applied to crosstabulations of prehistoric sites by habitat and gross location (Table 7-11; first and second runs), habitat and combined stream rank (Table 7-12), and gross location and combined stream rank (Table 7-13). In each instance a hypothesis proposing that the site distribution was affected by the variables in question was accepted. Tests, the second run, which contained the stream rank variable were discarded as were the tests of both runs for which the control variable was historic sites.

The results summarized in Table 7-11, in particular, bear on the third problem of locational tendencies. For example, a comparison of frequencies of observed sites and expected sites indicates that (a) 10% more than were expected were observed in the Wooded High Terraces habitat, (b) 16% more than were expected were observed south of the Cimarron River, and (c) 161% more sites than were expected were observed south of the Cimarron in the Wooded Stony Uplands habitat. The implications of such facts are not understood, however, as temporal considerations have not permitted a careful study of locational tendencies beyond those already cited for management purposes. For this reason, the recitation of additional percentages will not be continued. It is not clear how much such figures reflect the locational preferences of the occupants--a difficult matter to ascertain under the best of circumstances--and how much they reflect extraneous factors. The latter may include the inclusion or termination of habitats

Table 7-11. Effects of Habitat and Gross Location Distribution of Prehistoric Sites

H_1: The distribution of prehistoric sites is significantly affected by habitat and gross location.

H_0: The distribution of prehistoric sites is not significantly affected by habitat and gross location.

	Location				
Habitat	N. of Ark.	S. of Ark.	N. of Cim.	S. of Cim.	Total
Bottomland	18	9	14	14	55
Wooded Terraces	37	4	34	16	91
Grassy Terraces	10	18	9	3	40
Wooded Upland	30	3	8	23	64
Total	95	34	65	56	250

Chi-square 61.96

Significant at .0001

Table 7-12. Effects of Habitat and Stream Rank on Distribution of Prehistoric Sites

H_2: The distribution of prehistoric sites is significantly affected by the habitat and stream rank.

H_o: The distribution of prehistoric sites is not significantly effected by the habitat and stream rank.

	Stream Rank					
Habitat	0/1/8	2	3	4/5	6/7	Total
Bottomland	3	13	15	17	7	55
Wooded Terraces	26	30	8	5	22	91
Grassy Terraces	7	11	9	4	9	40
Wooded Upland	18	20	9	11	6	64
Total	54	74	41	37	44	250

Chi-square 41.50

Significant at .0001

Table 7-13. Effects of Gross Location and Stream Rank on Distribution of Prehistoric Sites

H_3: The distribution of prehistoric sites is significantly affected by gross location and stream rank.

H_0: The distribution of prehistoric sites is not significantly affected by gross location and stream rank.

Gross Location	Stream Rank 0/1/8	2	3	4/5	6/7	Total
N. of Ark.	14	27	31	14	9	95
S. of Ark.	5	14	5	2	8	34
N. of Cim.	19	13	3	11	19	65
S. of Cim.	16	20	2	11	8	57
Total	54	74	41	38	44	251

Chi-square 49.02

Significant at .0001

and water courses by arbitrary project boundaries, the partial or complete inundation of habitats and water courses, the exposure of possibly extensive site bearing soils only along an eroded bank or slope, and the lumper/splitter site-assigning proclivities of each survey team.

Finally, there are two additional observations about the location of sites which are best placed at the end of this section. First, the reader's attention is directed to the Arkansas River section of the Keystone Dam Quadrangle and to the major tributaries which veered to the east or west on entering the river valley. Comparison with Figure 7-3 will indicate that a number of sites which now appear to have fronted on the Arkansas River actually fronted on a lesser tributary and perhaps a preferable source of drinking water. The same situation may be present elsewhere along the Arkansas or the Cimarron. Second, an effort was made to test Salisbury's observation (Chapter 5) that the exposure of sites along the edge of the lake may well be a function of a fortuitous juxtaposition in levels of a site-bearing paleosol and the normal low water pool elevation of the lake (723 feet MSL). The alternative existed that the location of sites and the normal low water elevation might both reflect a significant, but hitherto unrecognized, geographical variable. This proved not to be the case, however, for at least the elevation of the lake pool. Fred Becker, Jr., of the Corps Hydraulics Branch, Tulsa, has indicated that the choice of a normal low water pool elevation was an economic decision which evolved out of a "trade-off" between the authorized and desired purposes of the lake (1980, personal communication).

Site Activity-Type

Loci of human activity now identified as sites are presumed to have varied in the nature of the activities which occurred there, in the duration of the occupation, and in the rate at which they were reoccupied. Notwithstanding some circumstantial evidence to support these presumptions, attempts to classify particularly the prehistoric sites in terms of any sort of functionally-oriented taxonomy have been hampered by four sorts of limitations imposed by conditions in the project area and inherent in the strict reliance on survey data. These are (1) that a majority of the prehistoric sites are exposed as beach scatters, (2) that the areal extent of most deposits cannot be estimated from beach scatters alone, (3) that the number of discrete components and their areal extent cannot be determined from beach scatters alone, (4) that the artifactual density of deposits must be estimated from beach scatters which have been disturbed by water action and human activity, and (5) that beach scatters are maintained in a state of skewed uniformity through repeatedly being selectively collected by non-scientist collectors. The outcome is that, whether one selects a so-called "functional" taxonomy (e.g., domestic site, kill site, quarry site, etc.), a taxonomy emphasizing duration of occupation (Dickson 1979), or a Beardsley-derived taxonomy emphasizing subsistence strategies (Saunders 1975:19-21; also see Beardsley, Holder, Krieger, Meggers, Rinaldo, and Kutsche 1956), the survey data from the prehistoric sites, in particular do not facilitate the assigning of site types.

Originally, it was intended to assign each project area site an activity-type based on the aggregate of the activities inferred from its artifacts and features, its size, and the inferred duration of occupation. (The term "activity-type" is preferred to functional type in this study.) In actuality the only prehistoric activity-type which could be distinguished confidently was one petroglyph site (Os-315), and even this site may be at the upper end of an inundated site which was more diverse in terms of the activities represented. Most of the remaining prehistoric sites are simply lumped into an ambiguous category referred to as "Camp/ Village." Probably the great majority were occupied seasonally at most, but except in the instances of obvious Paleo-Indian or Archaic sites, the evidence to support such an inference generally is absent.

The activity-type of many historic sites was identified through informants or through documents. In all, 12 types were identified. They include brick kilns (1), wayfarers camps (4), cemeteries (2), dumps (4), domestic (33), and indeterminate oil processing facility, sandstone quarries (2), roads (1), railroad depots (1), oiltank barracks (1), and villages (6). Dump sites were identified by dense concentrations of miscellaneous fragmentary artifacts. Domestic sites were identified by the size and shape of structure foundations and the associated features and artifacts. The villages were all previously documented and the category presumes a variety of domestic, social, and ideological activities. The remaining 25 components have been placed in an "indeterminant" category. Most are beach scatters or plowed field exposures and their activity-type is not certain.

As the preceding figures indicate, the modal activity-type is the habitation. Many of the components in the indeterminate class are probably the remains of domestic sites as well.

Activities

For prehistoric sites, in particular, the most that can be inferred in a behavioral sense are some of the activities which occured on the site or for which the site served as the home base. The following activities were inferred from artifacts observed on project area sites. Associations between prehistoric artifacts and activities were drawn, in large part, from Dickson (1979:124), House (1975:55-73), and Skinner and Gallagher (1974:18).

1. Cooking: fire-cracked rock, charred animal bones, soot on rock shelter walls.
2. Cereal, nut, or raw meat preparation: manos, metates, bedrock mortars, pestles, cup stones (?).
3. Tool manufacture or repair: cores; primary, secondary, and tertiary flakes; hammerstones; finished and unfinished chipped or ground stone tools; bedrock grooves; abraders.
4. Hunting: projectile points, atlatl weights, animal bones.
5. Farming: hoes, farming machinery.
6. Wood, bone, hide, or flesh working: drills, spokeshaves, knives, scrapers.
7. Stone quarrying or collecting: fire-cracked rock, river cobbles, piled sandstone or limestone blocks.
8. General subsistence activities (Historic Period): farming machincery, animal pens, barn foundations.
9. General domestic activities (Historic Period): domestic artifacts, habitation foundations.
10. Burial: extant burials or human bone.

11. <u>Ritual, social, or recreational painting</u>: pictographs.

12. <u>Ritual, social, or recreational rock carving</u>: petroglyphs.

13. <u>Dumping</u>: concentrated miscellaneous artifacts.

14. <u>Oil production related</u>: legal documentation.

15. <u>Brick manufacture</u>: kiln, informant knowledge.

16. <u>Travel related</u>: roads, travel facilities (e.g., train depots).

17. <u>Indeterminate activities</u>: cupstones, "stone disk" (informant 7), small hematite celts, stone pipes, pottery.

Given the prehistoric artifacts observed on beach scatters, the most common activities were probably concerned with cooking, tool manufacture and repair, and stone collecting primarily for middens but also perhaps for tool manufacture. Some worked and unworked chert cobbles from systematically collected sites appear to have come from river gravels and there is at least one instance, at Cr-99, where a localized exposure of milky quartz and quartzite cobbles were being exploited. Projectile points and metates in private collections indicate that hunting and nut or cereal preparation were activities more common than might be inferred from site assemblages alone. Only one site shows obvious evidence of specialized activities. This is Os-365, where there is an abnormally high concentration of mano and metate fragments on the beach scatter. Approximately 50 percent of the historic sites show evidence of domestic and/or subsistence activities.

CHAPTER 8

COLLECTION AND EXCAVATION PHASE

Systematic collections and/or test excavations were undertaken at 25 sites for the purposes of determining the (1) depth, (2) thickness, (3) areal extent, and (4) integrity of the cultural deposit, and the (5) age, (6) cultural affiliation, and "function" or activity-type of the site. This chapter examines the procedures and results of work done largely over an 11 day period by teams of two or three members.

Procedures

Procedures which are discussed and critiqued in this section include the selection of the sample, the collection and excavation procedures, and the analysis of the artifacts.

Drawing the Sample

The sampling program was confined to prehistoric sites, 174 of which had been recorded when the sample was taken. As the habitats described in Chapter 7 had not yet been defined, it was not possible to base the selection of the sites on the sort of sound locational criteria which had been envisioned in the research proposal (Chapter 6). Instead, three criteria were chosen which would at least insure a spatial and temporal crossection of the sites. These criteria were the cultural period: Prehistoric, Paleo-Indian, Archaic, Post-Archaic; the gross location, north of the Arkansas River, west of the confluence on the triangle, south of the Cimarron and Arkansas rivers; and, a quadrant assignment.

Sites were assigned to quadrants to insure that the less number of sites in the western half of the project area would be adequately sampled. Universal Transverse Mercator reference lines (see Edwards 1969) were utilized as axes of the quadrant system. The 7_{40} easting reference line served as the north/south axis, while the 40_{11} northing reference line served as the east/west axis.

Sites were eventually grouped into 18 utilitarian strata. In compliance with the research proposal, a 20% sample was then taken from each of the strata. This was accomplished, however, by taking a 15% (or one site minimum) random sample from each stratum, for a total of 18% of the sites, and then taking the remaining 2% by nonrandom means. The latter was done to insure that several sites worthy of testing would be included in the sample. In all, a total of 37 sites were selected, 31 randomly and 6 nonrandomly. The sites selected by nonrandom means were Cr-106, Cr-110, Os-22, Pw-29, Pw-83, and Pw-85. As the strata are not particularly sensitive to either cultural or ecological variation, they are not identified in the following discussion.

Surface Collections

Systematic collections were made within a universal grid system. Such a system has perpendicular axes and is read outward from the center; in this instance, in one-meter units: N1E1, N1E2, N1E3, etc. Unfortunately, there was some variance from site to site in the alignment of the axes, but this is discussed in the field notes for each site.

As the procedure was conceived, each site would be collected using some variation of the basic grid system in conjunction with the rule of thumb that on sites less than 50 m in length there should be at least two transects (only one need be random) and on sites more than 50 m in

length there should be at least one random transect within each 50 m interval. With respect to linear beach scatters it was recommended that transects be collected along the axis which most closely paralleled the waterline. On peninsulas or anywhere else where the areal extent of sites was better defined, a point should be chosen near the center of the site and north/south and east/west transects laid out accordingly.

Transects were to be collected from the waterline to a square beyond which no debris was observed. All that was required to implement the procedure was a random numbers table, a tape measure attached to a fixed rebar point (several such points might be required on a long site), a compass, and two heavy duty strings (with survey pins) marked off in one meter intervals. It was reasoned with these simple tools a gridded transect could be laid out in a few minutes' time, collected, and then moved to the next spot selected. In actuality, several tall banks, steep slopes, grasses, and shrubbery which had to be matted or chopped down impeded the progress of the collecting process and lessened the accuracy of the final product. In other instances time constraints or the absence of surface debris dictated that the procedure be modified or scrapped, respectively. Nevertheless, where the technique was employed it provided a fairly accurate means of quickly laying out scattered transects across a large site area. It also permitted single diagnostic artifacts to be quickly pinpointed before they were collected.

Within the sampled squares of the transects, all fire-cracked rock larger than a quarter was to be counted. All other artifacts were to be collected and bagged by squares.

Excavations

It was proposed that at least one randomly placed test pit should be excavated in each transect and, if necessary, at least one non-randomly placed pit outside the transects to determine the areal extent of the site. However, time constraints again forced a modification of the procedure. There proved simply not enough time to excavate a pit in each transect and as the number of work days decreased, the tendency to concentrate on non-randomly placed pits and shovel tests for specific sorts of information increased.

Pits were excavated in 10 cm levels unless thinner natural strata were encountered. All artifacts, with the exception of the fire-cracked rock, were uniformly collected. For the most part of the fire-cracked rock was either bagged by levels or counted and left on the site. Attention to the fire-cracked rock proved a shortcoming of both the collecting and excavation procedures.

For several reasons the actual instances of collecting the sites did not always conform to the foregoing procedures. For one thing, site conditions were varied and the brief collecting period (10 days total) did not permit adequate consultation time to best adapt the procedures to specific circumstances. Secondly, inclement weather made access to some sites more difficult and thus cut into the already too brief investigation time for specific sites. At Pw-86, for example, dangerously choppy water on the lake meant that a 50 minute walk to the site must be substituted for a 10 minute boat ride. Finally, a number of beach scatters were newly inundated at the time they were to be collected and thus no surface collections were made on these sites. Each team was encouraged to complete two sites a day, although this standard was rarely met.

Artifact Analysis

So few artifacts--other than fire-cracked rock--were collected during the testing phase that the sort of "functional" analysis proposed in Chapter 6 is simply not a realizable goal. Instead, the artifact "analyses" undertaken in this chapter are largely confined to listing significant specimens which were found. Projectile points, however, are described in Table 8-1. Special attention is given to projectile points because they are often temporally diagnostic and because such descriptive data may eventually prove useful in taxonomic studies. Explanatory data for Table 8-1 are contained in Figures 8-1 and 8-2. Taxonomic labels employed in this study are those commonly found and defined in studies of Oklahoma archeology.

Sites Not Investigated

Thirteen sites were not investigated. Pw-16 proved to be outside the project area. Cr-98, Cr-115, Pw-97, Pw-108, and Pw-109 were inundated by recent rains. There was simply not enough time to visit Cr-107, Cr-110, Os-328, Os-330, Os-365, Os-374, and Os-387.

Cr-71

This site was recorded first by a survey team and subsequently reported by Informant 7. The original habitat of the site was the Wooded Stony Uplands flanking Salt Creek. Presently, the site is most apparent as a beach scatter below a low bank. The bank is just higher than the normal elevation of the lake pool and thus the beach scatter and the bank are frequently inundated, as they were when the site was visited by the testing team. The scatter extends around a point to the east and is at least 60 m in length.

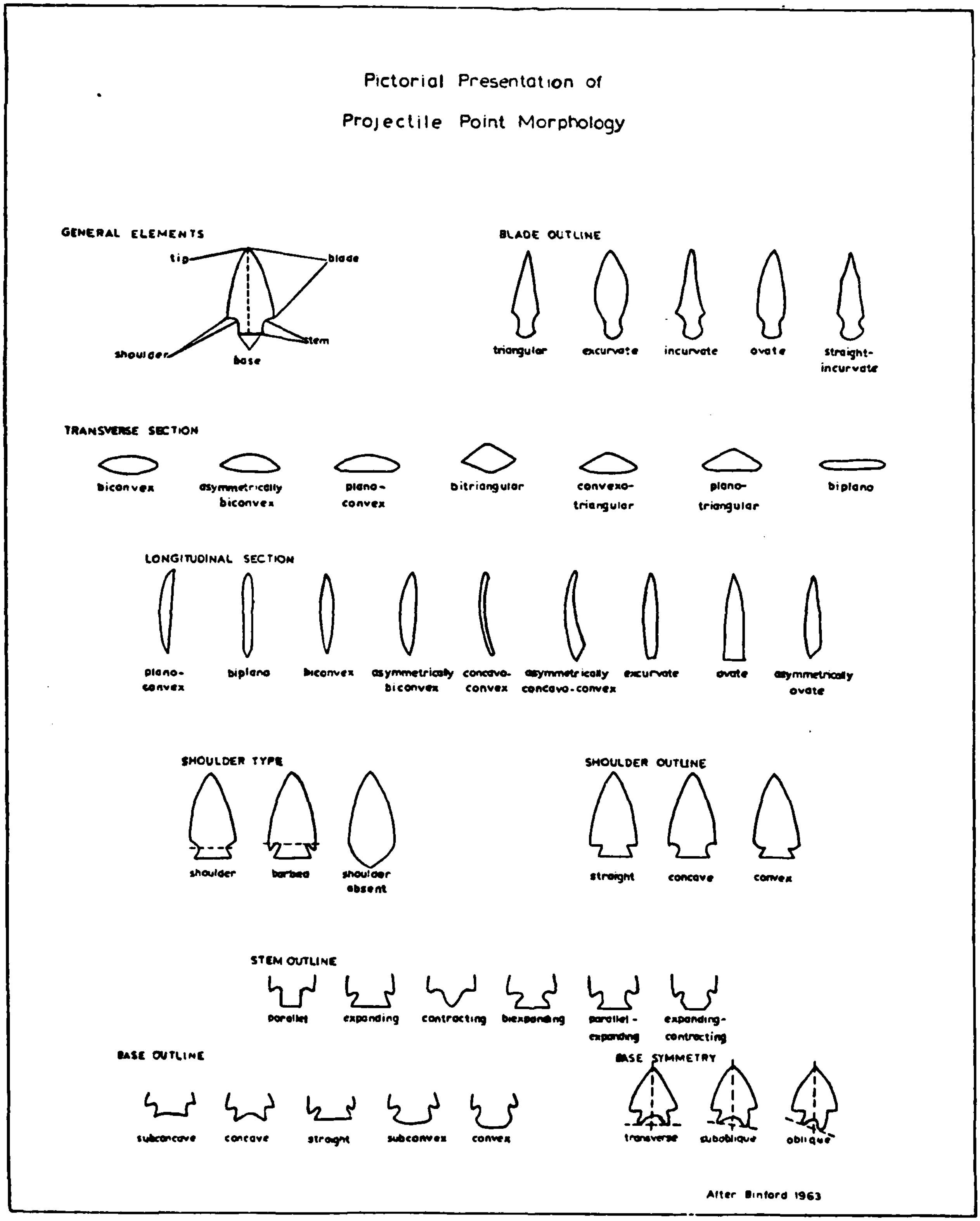
Pictorial Presentation of
Projectile Point Morphology
GENERAL ELEMENTS
tip
blade
shoulder
base
stem
BLADE OUTLINE
triangular
excurvate
incurvate
ovate
straight-incurvate
TRANSVERSE SECTION
biconvex
asymmetrically biconvex
plano-convex
bitriangular
convexo-triangular
plano-triangular
biplano
LONGITUDINAL SECTION
plano-convex
biplano
biconvex
asymmetrically biconvex
concavo-convex
asymmetrically concavo-convex
excurvate
ovate
asymmetrically ovate
SHOULDER TYPE
shoulder
barbed
shoulder absent
SHOULDER OUTLINE
straight
concave
convex
STEM OUTLINE
parallel
expanding
contracting
biexpanding
parallel-expanding
expanding-contracting
BASE OUTLINE
subconcave
concave
straight
subconvex
convex
BASE SYMMETRY
transverse
suboblique
oblique
After Binford 1963

Figure 8-1.

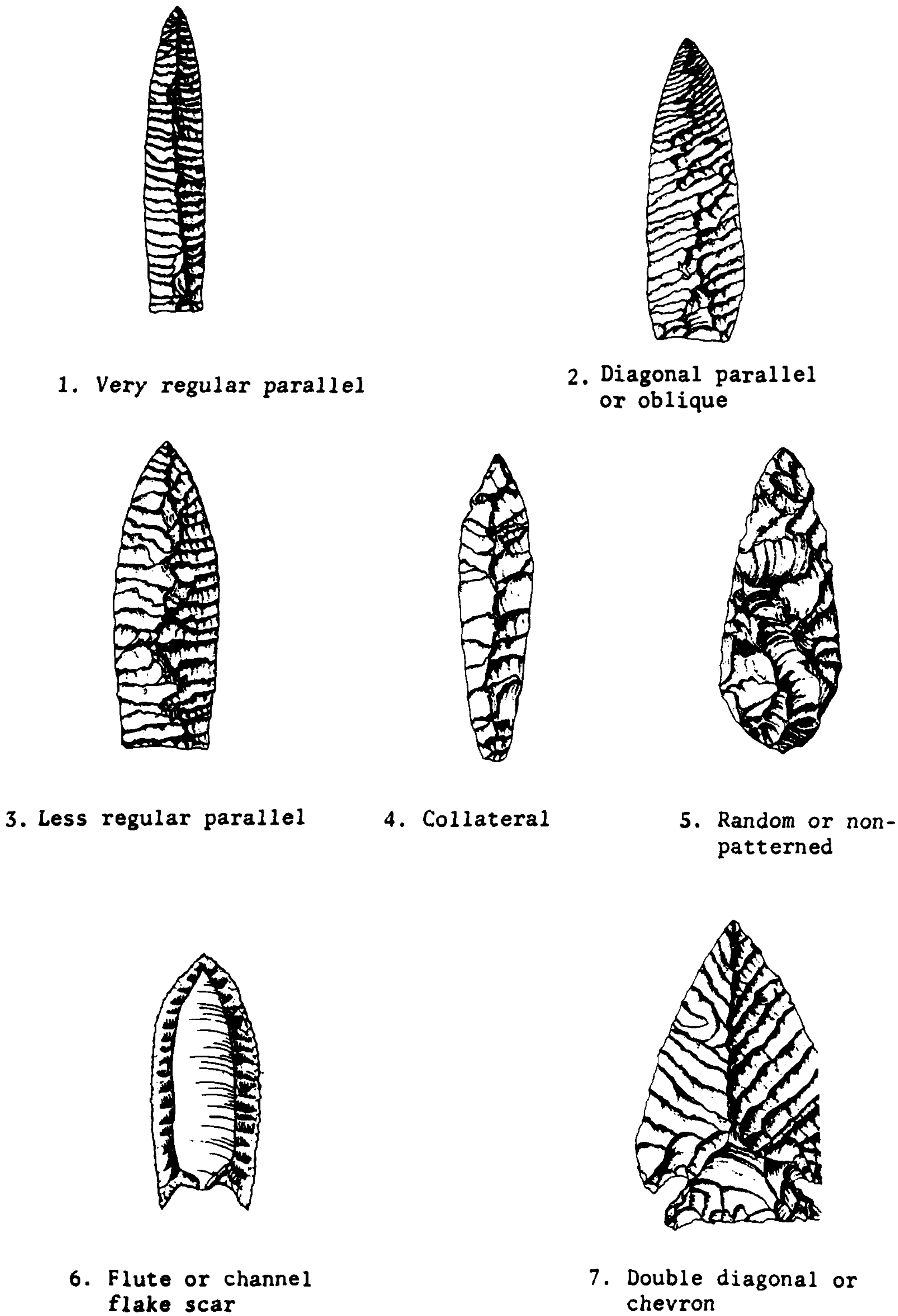

Figure 8-2. Idealized Projectile Points Showing Varieties of Flaking (from Crabtree 1972:87)

Table 8.1. Projectile Point Descriptions

			DIMENSIONS			BODY			BLADE				
											Lateral Edge		
Type	Site	Artifact No.	Length	Maximum Width	Maximum Thickness	Transverse Section	Longitudinal Section	Treatment	Length	Mid-Blade Width	Outline	Symmetry	Treatment
Gary	Pw-88	1	4.80	2.30	0.69	asym. bicnvx	asym. ovt	5	3.17	1.65	trgl	sym	evn
Gary (frg)	Pw-94	2	4.18+	2.18	0.62	asym. bicnvx	excr	5	2.63+	---	trgl/excr	asym	evn
Gary (frg)	Cr-79	3	2.82+	2.69	0.62	asym. bicnvx	---	5	1.36+	---	---	asym	---
Gary	Pw-86	1	4.28	2.87	0.75	cnux-trgl	pln-trgl	5	2.81	1.80	trgl	sym	evn
Edgewood (frg)	Cr-75	3	2.71+	2.23	0.50	pln-cnvx	bicnvx	5	1.88+	---	trgl	sym	evn
Ellis (frg)	Cr-74	1	3.19+	2.92+	0.58	asym. bicnvx	bicnvx	4	2.36+	---	trgl/excr	asym	evn
Ellis (frg)	Os-312	1	2.69	2.12	0.68	bicnvx	bipln	5	1.85+	---	trgl	sym	evn
Williams (frg)	Cr-76	1	4.17+	3.32+	0.73	asym. bicnvx	---	5	2.96+	---	---	---	evn
Maud (frg)	Pw-115	1	1.46+	0.90+	0.30	asym. bicnvx	bicnvx	4	1.46+	---	recrv	sym	evn
Fresno (frg)	Cr-73	2	1.95+	1.28	0.27	bicnvx	bicnvx	4	1.95+	---	trgl	sym	evn
Reed (frg)	Cr-73	1	1.35+	1.19	0.29	asym. bicnvx	asym. bicnvx	5	0.63+	---	trgl	sym	evn
Reed (frg)	Cr-75	2	0.82+	1.05	0.34	bicnvx	---	5	0.36+	---	---	---	---
Unclassified (frg)	Pw-88	3	3.16+	2.48	0.64	bicnvx	bixnvx	5	2.03+	---	---	---	---
Unclassified (frg)	Pw-94	1	3.64+	2.78	0.95	cnvx-trgl	---	4	2.37+	---	---	---	---
Unclassified	Os-309	1	4.01	2.17	0.71	asym. bicnvx	asym. bicnvx	4	2.71	1.86	ovt	sym	evn
Unclassified (frg)	IA-105		4.31+	2.10	0.66	bicnvx	bicnvx	3	4.31+	---	recrv	sym	ser/grd
Unclassified (frg)	Cr-14	1	8.69+	2.26+	0.72	bicnvx	bipln	4	7.92+	---	trgl	sym	evn
Unclassified	Pw-92	2	4.81	2.40	1.84	asym. bicnvx	asym. bicnvx	4	3.44	1.71	trgl	sym	evn
Unclassified	Cr-75	1	3.81+	2.34	0.50	asym. bicnvx	asym. bicnvx	4	2.96	1.81	trgl	asym	evn
Unclassified	Os-314	1	3.11	1.66	0.37	pln-cnvx	cnvx	5	1.80	0.81	trgl	asym	evn
Unclassified (frg)	Cr-78	1	1.55+	2.23+	0.41	bicnvx	---	-	1.35+	---	---	---	---

	SHOULDERS			NOTCHES				STEM			BASE EDGE					
	Width	Type	Outline	Width at Notch	Location	Av. Notch Width	Av. Notch Depth	Length	Mid-Stem Width	Outline	Width	Outline	Symmetry	Treatment	Material	Figure
Pw-88	2.30	shld	str	N/A	N/A	N/A	N/A	1.63	1.55	cntr	N/A	cnvx	trvs	unmd	cht	8-3a
Pw-94	2.21	shld	cncv	N/A	N/A	N/A	N/A	1.55	1.30	cntr	N/A	cnvx	suboblq	unmd	Keo	8-3b
Cr-79	2.69	shld	cnvx	N/A	N/A	N/A	N/A	1.46	1.28	cntr	N/A	cnvx	suboblq	unmd	Keo	8-3c
Pw-86	2.87	shld	cncv	N/A	N/A	N/A	N/A	1.47	1.17	cntr	0.48	cnvx	suboblq	unmd	Nva	8-3d
Cr-75	2.23	brb	cncv	1.30	crn	0.50	0.34	0.83	N/A	exp	1.78	subcncv	trvs	grd/thn	Keo	8-3e
Cr-74	2.29+	brb	cnvx	---	crn	---	---	0.83	N/A	exp	---	str	trvs	grd/thn	Ctr	8-3f
Os-312	2.12	brb	cnvx	1.39	crn	0.62	0.27	0.84	N/A	exp	1.65	str	trvs	thn	Nva	8-3g
Cr-76	3.32+	brb	cnvx	2.03	crn	0.82	0.38	1.21	N/A	biexp	1.89	subcncv	trvs	unmd	Kay-t	8-3h
Pw-115	N/A	abs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.90+	cncv	trvs	unmd	cht	8-3i
Cr-73	N/A	abs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.28	str	trvs	unmd	Kay-t	8-3j
Cr-73	1.19	brb	cnvx	0.73	sde	0.52	0.22	0.72	N/A	exp	1.08	str	trvs	thn	Nva	8-3k
Cr-75	1.05	brb	cnvx	0.70	sde	0.32	0.10	0.46	N/A	exp	0.91	subcnvx	trvs	unmd	Keo	8-3
Pw-88	2.48	crn. rmvd	cnvx	1.64	crn	N/A	N/A	1.13	0.64	irg	1.51	subcnvx	suboblq	unmd	Nva	8-4a
Pw-94	2.57	brb	cnvx	1.55	crn	0.48	0.15	1.27	1.50	cntr	N/A	cnvx	suboblq	unmd	cht	8-4b
Os-309	2.17	crn. rmvd	cnvx	1.64	N/A	N/A	0.24	1.30	1.69	parl	1.75	str	trvs	grd/thn	Ctr	8-4c
IA-105	N/A	abs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.93	cncv	trvs	grd/thn	pet	8-4d
Cr-14	---	brb	cnvx	---	crn	---	---	0.77+	N/A	---	---	---	---	---	Peo	8-4e
Pw-92	2.40	brb	cncv	1.74	sde	0.93	0.26	1.37	N/A	exp	1.94	cncv-cnvx	trvs	thn	Nva	8-4f
Cr-75	2.34+	crn. rmvd	cncv	2.09	N/A	N/A	0.11	0.85	2.08	str	2.17	str	trvs	thn	Nva	8-4g
Os-314	1.66	brb	cncv	1.20	sde	0.73	0.20	1.31	N/A	irg. exp	1.50	irg. cnvx	suboblq	unmd	Nva	8-4h
Cr-78	2.23+	brb	cncv	0.82	crn	0.22	---	0.46	N/A	exp	1.29	subcnvx	---	unmd	Kay-t	8-4i

KEY TO ABBREVIATIONS

asm	asymmetrical	frg	fragment	recrv	recurved
brb	barb	grd	ground	rmvd	removed
cht	unidentified chert	Kay	Kay County chert	sde	side
cncv	concave	Keo	Keokuk chert	ser	serrated
cntr	contracting	irg	irregular	shld	shoulder
cnvx	convex	Nva	Nova chert	sym	symmetrical
crn	corner	oblq	oblique	t	thermally altered
Ctr	Cotter dolomite	ovt	ovate	thn	thinned
evn	even	parl	parallel	trgl	triangular
excr	excurvate	Peo	Peoria chert	trvs	transverse
exp	expanding	pet	petrified wood	unmd	unmodified
		pln	plano		

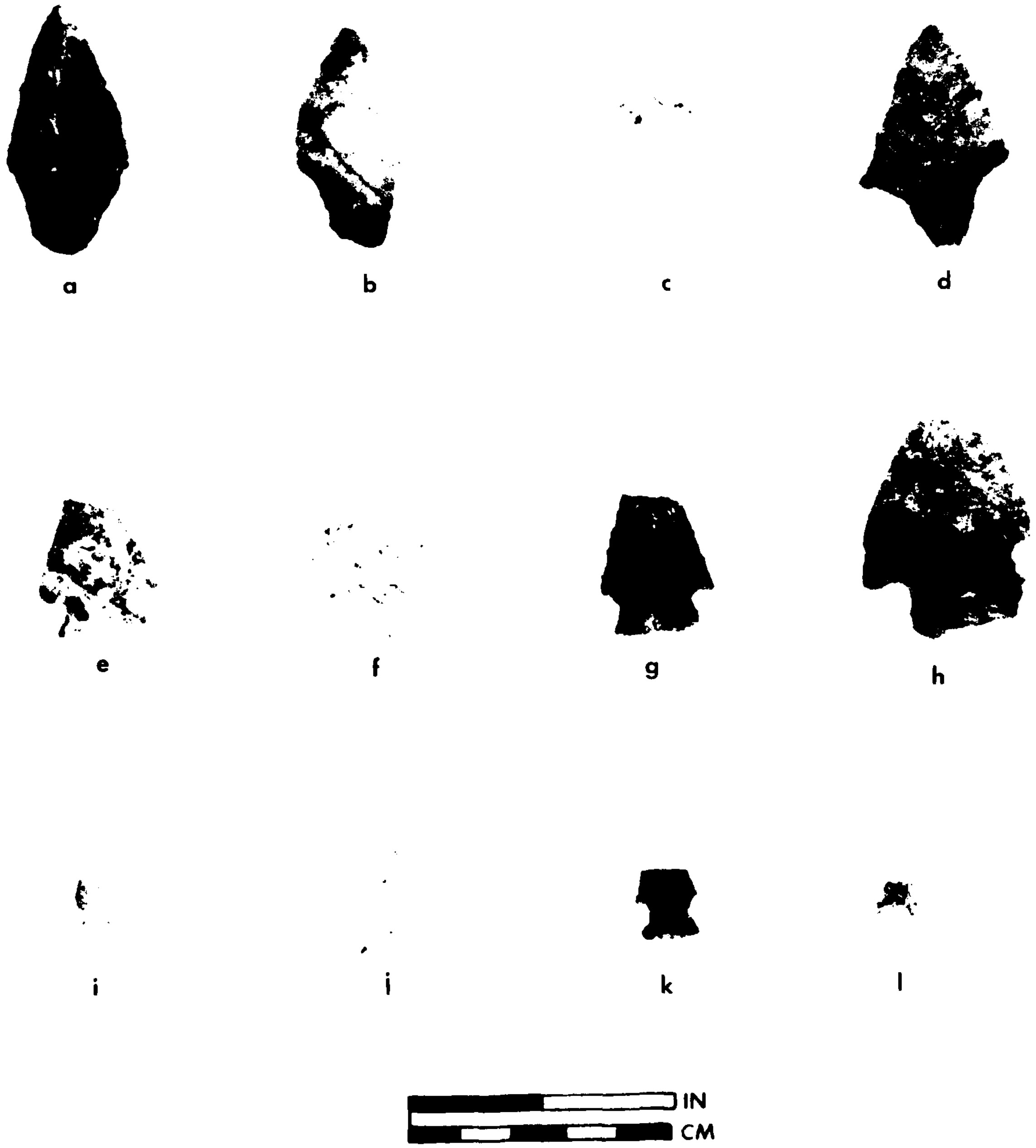

Figure 8-3. Classified Projectile Points. Gary-style: a) Pw-88/1, b) Pw-94/2, c) Cr-79/3, d) Pw-86/1; Edgewood-style: e) Cr-75/3; Ellis-style: f) Cr-74/1, g) Os-312/1; Williams-style: h) Cr-76/1; Maud-style: i) Pw-115/1; Fresno-style: j) Cr-73/2; Reed style: k) Cr-71/1, l) Cr-75/2.

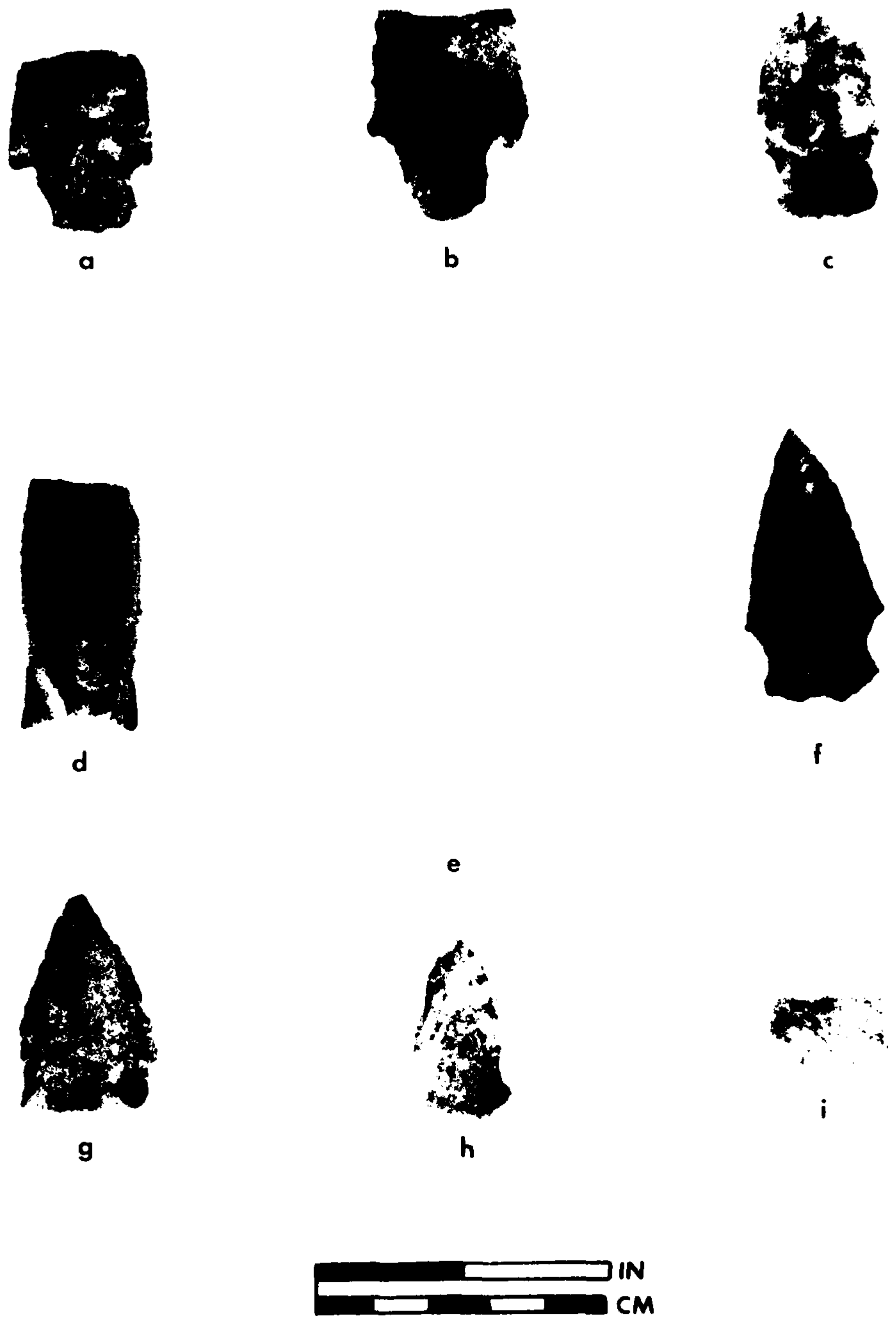

Figure 8-4. Unclassified Projectile Points. a) Pw-88/3, b) Pw-94/1, c) Os-309/1, d) IA 105, e) Cr-14/1, f) Pw-92/2, g) Cr-75/1, h) Os-314/1, i) Cr-78/1

Figure 8-5. Miscellaneous Artifacts. Triangular "knives": a) Cr-80/1, b) Pw-88/2; biconvex knife or projectile point fragment: c) Pw-86/1; "knives": d) Pw-83/1, e) Pw-93/1, f) Tu-23/1, g) Tu-23/2; reworked projectile point and/or hafted scraper: h) Cr-79/ ; T-shaped drill: i) Os-362/1; blank: j) Cr-103/1, bone awl or needle: k) Tu-23/3

Survey notes report fire-cracked rock, debitage, and one potsherd. The smooth surfaced, sand tempered sherd was collected and proved to lack diagnostic attributes. Informant 7 had collected the site when the lake pool was down several feet. Artifacts listed in his notes include points, drills, scrapers, knives, "flake knives," "core knives," cores, utilized flakes, choppers, a graver, manos, a cup stone, hammerstones, and ground hematite. Informant 7 probably included as part of his collecting area the beach scatter around the point. This part of the site was first observed subsequent to the testing phase when the lake pool was at least two feet below normal.

Testing at Cr-71 was confined to the western portion of the site--the area recorded during the survey. Above the bank the area was largely composed of exposed sandstone bedrock. A 35 m by 38 m grid was laid out and two transects were selected, only one randomly. Fire-cracked rock and a cup stone were all that was observed in one square near the waterline. Additionally, a square and a shovel test--both placed nonrandomly--were excavated near the waterline (and the inundated bank) where the bedrock was not exposed. In the test pit bedrock was encountered 6 cm below the surface and the artifacts were confined to fire-cracked rock. In the shovel test bedrock was encountered at 20 cm and fire-cracked rock is all that was discovered.

A surface feature proved the most important find on the site. It consisted of at least four pitted "cup stone" depressions in the bedrock. The presence of these depressions in the bedrock indicates that the depth of soil on the portion of Cr-71 which was tested was never very great.

Based on the projectile point and ceramic evidence presented in Table 7-6, it is clear that Cr-71 had a long occupational history. However, if

the bedrock cup stones are any indication of what the habitat was like prehistorically, then one would not expect to find much evidence of the occupational history in the part of the site which has been tested. Either the main occupation area of the site is inundated or it is located to the east of the tested area. This site definitely deserves additional testing.

Cr-72

This site was originally located on a low terrace above the Cimarron River. Presently, the site is most apparent as a thin beach scatter below a low grassy hummock, approximately 20 m long and 13 m wide. When the lake pool is down the site extends approximately 100 m along the beach. Survey notes report the presence of a fire-cracked rock, debitage, an aborted preform, an edge abraded cobble, and a scraper.

The hummock is all that remains of the site itself. Two randomly selected transects were collected with a grid--26 m by 40 m--laid out over the hummock and the beach scatter. Fire-cracked rock and a few bits of debitage were observed in these transects.

A nonrandom test pit was excavated at the highest point of the hummock. The pit was excavated in four 5 cm levels. Level 1 consists of a sterile beach sand. Level 2 consists of a loose sand and contained fire-cracked rock, a few bits of debitage, and a piece of bottle glass. Level 3 consists of a sandy, mottled clay and contained fewer artifacts. Level 4, composed of the same clay, was sterile.

A thin scatter to the north of the hummock indicates that the site extended for some distance along the low terrace. All that remains,

however, is the beach scatter and the hummock, both of which are frequently inundated and crossed by cattle. The bottle glass suggests that the remaining remnant of the site has little integrity. No new cultural information was learned from the additional field work done on this site. Cr-72 is not recommended for future work.

Cr-103

This site is exposed as a slope-washed, 24 m long beach scatter below a point along a first order creek. The original habitat of the site was Wooded High Terraces and Slopes. Survey notes report a thin scatter of fire-cracked rock, debitage, a quartzite hammerstone, and an Eva-style projectile point. The Eva point suggests the presence of an early Archaic component.

When Cr-103 was revisited by a testing team, the low bank out of which the artifacts appeared to be eroding was inundated. A 11 m by 12 m grid was laid out on the slope above the waterline and two randomly selected transects were collected. Nothing was observed in the transects, although there was a very thin scatter of fire-cracked rock and debitage within the gridded area. A randomly selected square was then excavated to a depth of 45 cm where mud was encountered. Two sloping natural strata were distinguished--a silty gray soil over a new clayey soil--and a diffuse scatter of fire-cracked rock and debitage was found throughout. Because no concentrations of artifacts were discovered in the test square, shovel pits were excavated 3 m and 5.4 m upslope and nearly parallel to the test square. These pits proved sterile, except for a single flake, at a depth of 47 cm in the lower pit. This flake was resting on a compact reddish-tan clay. Finally, an exposed eroded face at the waterline

was shaved and inspected because fire-cracked rock had been observed below it on the shoreline. A single piece of fire-cracked rock was detected at a depth of 47 cm below the surface.

The single most important find was from the test pit. This was a blank (Fig. 8-5j) of a size suitable to manufacture an Eva point. It may be inferred from the presence of the blank that the Eva point was not carried onto the site during a later period.

The difficult question with respect to Cr-103 is the integrity of the deposit. It does not appear that the artifacts washed down from upslope or that they are concentrated on a living floor. Thus, unless the site was visited repeatedly--which might have been the case if, for example, there was an active spring in the drainage--then the circumstances which were observed were probably the result of some natural causes such as erosion and rebedding of artifacts and/or repeated inundation and vertical translocation of artifacts. The latter are favored without good justification. Cr-103 is significant because of its age, but it is unlikely that the site presently represents more archeologically than a source of Archaic artifacts. Intensive excavations are not recommended for this site.

Cr-106

Survey notes for this site describe a beach scatter, approximately 100 m in length, on a peninsula and below a low hill. The original habitat was Wooded High Terraces and Slopes. When revisited by the testing team, the beach scatter was completely inundated. Survey notes report the presence of fire-cracked rock, debitage, a Scallorn-style point, a cup stone, and several possible ground stone fragments. This scanty evidence suggests a Plains-Woodland or perhaps Plains Village component and a moderately diverse range of activities.

No artifacts were observed on the slope above the beach by the test team. Test excavations--which were necessarily confined to the same area--were conducted within a strip 54 m by 10 m, the long axis of which parallels the peninsula. A nonrandom test pit and two nonrandom shovel tests were excavated. One of the shovel pits was excavated on the low hill above the beach while the other was excavated on a second hill to the south of the first. Both pits were sterile. The test pit was excavated to the east of the first shovel test on the same hill. Two natural levels were exposed. Level 1 is 7 cm thick and consists of a dark brown clay mixed with humus. Level 2 is at least 63 cm thick and consists of a "silty sand." Four randomly distributed pieces of fire-cracked rock were found in Level 2.

The brief time spent at Cr-106 added little to what was already known about the site. Evidence in the test pit indicates that there is a diffuse artifact scatter of unknown dimensions behind the bank. However, the absence of a discernible artifact-bearing stratum in Level 2 perhaps means that intermittent inundation has so altered the character of the site that nothing of archeological significance remains. No additional work is suggested for Cr-106.

Os-22

This site is located in the Walnut Creek Recreation Area on what is presently a point. The point has been planted in grass and facilities are available for picknickers. The site is most apparent as a beach scatter extending northward and westward from the point. Survey notes for this site report the presence of fire-cracked rock, debitage, a nondiagnostic projectile point fragment, and a nondiagnostic potsherd which was collected. The original habitat was Wooded High Terraces and Slopes.

North and west axes, 37 and 100 m respectively, were laid out from the point. One randomly placed transect through the north/south axis was collected, as were two transects through the east/west axis. The squares above the beach all proved sterile, except in the case of the tailings in one gopher hole, which produced a single flake. The squares below the beach contained varying amounts of fire-cracked rock and debitage. A single randomly placed test pit was excavated above the beach. In this pit a 30 cm thick, brownish gray, loamy sand containing scattered fire-cracked rock and debitage was encountered approximately 20 cm below layers of tannish orange sand and a dark brown sandy loam. The same sequence of soils was corroboration in a shaved section of the bank.

The artifact bearing soil at Os-22 has been identified by Neil E. Salisbury, the project geomorphologist, as a paleosol. Shortly before the site was visited with Salisbury, a pothunter had shaved off the entire east/west bank with a shovel. Burnt bone was exposed during this vandalism.

This site is significant because of the paleosol and the potsherd, which probably narrows the age of the deposit to the Plains-Woodland or Plains Village period. Most likely the site has not been disturbed by construction or recreational activities. How much of the site remains is not clear. Additional excavations are called for, however, to refine the age of the paleosol. Projectile points or perhaps carbon-14 samples might be discovered.

Os-183

This site was previously recorded and also reported by Informant 7. The original habitat of the site was Wooded High Terraces and Slopes.

Presently the site is most apparent as a noncontinuous beach scatter along both sides of a peninsula approximately 140 m long and 45 m wide. Artifacts catalogued by informant 7 include points, drills, scrapers, knives, and "pottery."

Five randomly placed transects were laid out perpendicular to the long axis of the beach. They extended from the wooded area above the beach to the waterline. In all five instances, nothing was observed in the squares. Additionally, three test pits placed above the bank were excavated to a depth of one meter. All proved sterile except for an unidentifiable biface fragment found in one pit at 30-35 cm below the surface and a single flake found in the backdirt of another pit. Finally, a side-notched, concave-based point was removed from the beach but it was stolen before it could be analyzed.

The brief investigations at Os-183 added little to our knowledge about the site. Clearly there are artifacts still behind the bank, but the test pits did not indicate any concentrations. The pottery from the private collection suggests that the site is of Plains-Woodland or Plains Village age. Apart from the presence of pottery there is little that is unusual about the site. Thus, no special work is recommended at Os-183.

Os-309

This site was located in the Wooded Stony Uplands habitat above a second order stream. The site is most apparent as a scatter of fire-cracked rock and debitage across a severely eroded slope and as a surface scatter on an elevated area above the slope.

Investigations at the site were confined to two transects and two test squares on the elevated area above the slope. Some fire-cracked

rock and debitage along with middle and late Historic trash was observed in the transect squares. One test square was excavated to a depth of 20 cm and the other to a depth of 10 cm. The few artifacts which were found were mixed with historic trash.

Well into the investigation, a local resident informed the testing team that the elevated area above the slope had once been the site of an oil tank barracks--there are wells and old machinery surrounding the site. The tanks had consisted of huge redwood "barrels" and a few pieces of wood and parts of the corroded hoops still remain on the site.

It would seem that oil industry activity has largely destroyed Os-309. Evidence of a possibly intact deposit in the upper 20 cm of an eroded bank was not found in the test pits. The surface artifacts which were observed were probably the result of deflation. Oil industry activity was probably indirectly the cause as well of the slope erosion and of the continued destruction of the site along that erosion line.

A whole reworked point (Fig. 8-4c) and a point fragment were discovered on the surface scatter above the slope, but neither proved diagnostic. Because Os-309 appears to be largely destroyed, no additional work is recommended for this site.

Os-310

The beach scatter below this site was inundated when it was visited by the testing team. Survey notes report that the scatter was approximately 100 m in length and that fire-cracked rock, debitage, a metate fragment, several unifacial manos, and several Gary point fragments were present. Artifacts appear to be eroding out of the slope below grass covered dunes. The original habitat was Wooded High Terraces and Slopes.

No artifacts were observed above the waterline, thus the investigation was confined to shaving a section of eroded bank and to excavating four randomly selected squares within an area 25 m by 15 m. Within the four pits a single biface fragment was found in the top 10 cm of one. The soil profiles for each pit are quite similar: approximately 5 cm of a fine tan sand, over 20 cm of a brown silty sand, over an orange sandy clay. The biface fragment was discovered in the silty brown sand.

This site was interesting because the point fragments which were observed indicate that the beach scatter had not been recently collected. However, the test pits indicate that little of the site remains behind the bank or that the deposit is thin and artifacts diffuse. No additional work is recommended for this site.

Os-313

This site is most apparent as a 45 m beach scatter along a fourth order stream. Survey notes report a thin scatter of fire-cracked rock, a fragmented Gary-style projectile point (reconstructed, approximately 8 cm in length), a bifacially worked flake, and three pieces of debitage. The site was completely inundated between the time it was first discovered and subsequently revisited by a testing team. The original habitat was Bottomland and Low Terraces.

Testing phase activities were confined to collecting a single transect and to excavating a single test pit. The randomly placed transect extended from 5 m behind the bank to the waterline for a total of 8 m. The squares proved sterile except for a few pieces of fire-cracked rock observed on the narrow beach. The nonrandomly placed test pit was excavated 5 m behind the bank. Three natural strata were exposed. The

upper stratum (7-13 cm in thickness) consists of a sterile, gummy, black soil. The middle stratum (19-25 cm in thickness) consists of a clayey, olive gray soil and contained several pieces of decomposing fire-cracked rock. The sterile lower stratum consists of a yellow-brown clay of indeterminant depth.

Several pieces of plow scarred fire-cracked rock were observed on the beach scatter. The Gary point fragment could not be found, probably because it had been picked up by a fisherman.

The large size of the Gary point suggests an Archaic or early Woodland affiliation for the site. It is likely, therefore, that Os-313 was occupied seasonally or intermittently by peoples utilizing the resources of the habitat. What appears to be a discrete site is, along with Os-312 and Os-314, probably a continuous habitation zone of over-lapping occupation episodes. How far the site extends back from the the bank was not determined in the excavations.

Os-313 is frequently inundated and is possessed of a thin, apparently diffuse deposit, a portion of which at least has been disturbed by past agricultural activity. No additional work is recommended for this site.

Os-319

This site is located on what is presently the north side of a peninsula. The original habitat was Bottomland and Low Terraces. The site is most apparent as a thin 24 m scatter of fire-cracked rock and debitage below an eroded bank. There are broken up concrete foundations (Os-318) approximately 75 m to the south.

Excavations at Os-319 were confined to two randomly placed transects and a randomly placed test pit. A 15 x 20 m grid was laid out over the terrace and the beach and two north/south transects were selected. Nothing

was observed above the beach on the grassy terrace, but squares below the bank each contained several pieces of fire-cracked rock. The test pit was excavated to a depth of 19 cm where a layer of compact clay was encountered. A shovel pit was excavated another 25 cm into this layer with no change in the composition of the clay. A single piece of decomposing sandstone was discovered at approximately 20 cm below the surface of the pit, but no evidence of an artifact-bearing stratum was found. A diagnostic grab sample from the beach scatter consisted of a single facet core and a bifacial mano.

The brief investigations at Os-319 provide no clue as to how much of the site remains behind the bank or to the integrity of the deposit. The thin scatter of artifacts below the bank suggests that the site was not occupied intensively. This site is not recommended for additional work.

Os-334

This site is located along the southwestern side and tip of a peninsula near the confluence of a fourth order stream and the Arkansas River. The original habitat was Bottomland and Low Terraces. The site is exposed as a beach scatter and survey notes report the presence of a thin scatter of fire-cracked rock and debitage, a core, a unifacial mano, metate fragments, and a cup stone.

Several transects laid out across the site and the beach proved sterile as did two test squares and a shovel test above the beach. The single exception in one of the squares was a china sherd found at a depth of 45 cm below the surface.

While a few artifacts remain on the beach, the site itself appears to be disturbed and largely eroded away. Additional excavations are not recommended for this site.

Os-344

This site is most apparent as a 35 m beach scatter below an eroding slope. Survey notes report scattered debitage, several core fragments, and abundant fire-cracked rock. At the south end of the beach scatter there is a circular concentration of fire-cracked rock (partially covered by oil sludge from a pond 20 m east of the beach) which may be the remains of a hearth. It is not clear whether the feature eroded out of the slope or whether it was exposed through a process of deflation. The original habitat was the Wooded Stony Uplands.

When Os-344 was revisited by a testing team, the entire beach scatter was flooded and there was no evidence of the site in the wooded area above the beach. For this reason no surface collection was made. Excaation was confined to a test square and a shovel pit. The test square was excavated at the south end of the site, approximately 5 m east of the beach. Carried to a depth of 1 m, the test square proved sterile. The shovel pit was excavated near the north end of the site, approximately 5 m east of the beach. One flake and several pieces of fire-cracked rock were obtained from a dark, stony loam which overlay a sterile red sand at a depth of 35 cm.

The cursory excavations at Os-344 suggest that there is either a very diffuse deposit or, what is more likely, that only the eastern extreme of the site remains intact, the remainder already having been inundated or eroded away. Os-344 is probably not worthy of additonal attention.

Os-354

This site is most apparent as an 85 m beach scatter below one of the old towns partially inundated by the lake. Survey notes report the presence of fire-cracked rock, debitage, a Keota-style projectile point, and

middle to late Historic trash. The elevated grassy surface behind the bank is a "party" spot and informal picnic area. The original habitat was Wooded High Terraces and Slopes.

A 60 m east/west axis was sighted in across the site and from this line two north/south transects were randomly selected and collected. Nothing was observed above the bank, while below, a few prehistoric artifacts (fire-cracked rock and debitage) and a larger assemblage of historic artifacts were collected. Test excavations consisted of one randomly placed test square and two nonrandom auger tests above the bank and a nonrandom shovel test below the bank. Apart from a 3 cm silt deposit at a depth of approximately 32 cm below the surface, nothing was removed from the test pits but sand.

The Keota point is indicative of a Plains Village occupation. Unfortunately, little else can be said about the site. Either Os-354 has been entirely destroyed or it is a dune site with only a diffuse scatter of artifacts. Additional excavations are not recommended for this site.

Os-355

Survey notes for this site describe a beach scatter below a sandy bank. The beach scatter was inundated when the site was visited by the testing team. Survey notes report the beach scatter consisted of fire-cracked rock, a mano fragment, a cup stone, and debitage. The original habitat of Os-355 was Wooded High Terraces and Slopes. There is a very gentle slope toward the south and the Arkansas River.

No artifacts were observed on the narrow beach below the bank or on the surface above the bank by the testing team. Because nothing had been discovered behind the bank at Os-354, 200 m to the west, three

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shovel pits were excavated to determine if similar circumstances existed at Os-355. Two pits were excavated above the bank and one below the bank. The pits above the 45 cm bank were excavated to a depth of 1.10 m; the pit below the bank to mud at 30 cm. Allowing for the different elevations of the surfaces, the combined depths of the pits was 1.32 m. No artifacts were observed in the sand removed from these pits.

The conclusions drawn for Os-354 also apply to Os-355. Either the site was a dune site with a very thin scatter of artifacts or the cultural deposit has already been entirely destroyed. Additional work would not seem to be called for at Os-355.

Pw-23

This site was first reported by Brighton who writes that,

> This village area, about 1200 ft. by 300 ft., shows flint and sandstone debris, but it produced no artifacts. Surface indications are sparse and it is cut by an old county road, now gullied out. North of this cut is an early stone farm site with an old cistern. The site covers a large area but it appeared rather sparse from the present surface (1952:12).

Pw-23 apparently was not recognized by the survey team. It was still included in the site population, though, because it was thought to be above the normal elevation of the lake pool and because an informant (4) had reported that projectile points had been taken from a site at the same location before the construction of a boat ramp. The original habitat was Grassy High Terraces and Slopes.

An inspection of the locality revealed no cultural remains beyond perhaps a few scattered pieces of fire-cracked rock just south or on the inlet-side of the boat ramp. On the river-side of the ramp, wave action has cut away the slope and a portion of the asphalt paving leaving in its stead a steep bank. The profile in this bank revealed no evidence of a cultural deposit. Neither did the mud beach below the bank.

Areas to the east and south of the ramp are paved, graveled, or under planted grass. All suggest that the recreational land on which the site is located has been graded and contoured and that the site has probably been destroyed if, indeed, it had not already been severely eroded. No excavations were conducted.

Pw-29

This site was first reported by Brighton, who writes that,

> On a rise southeast of the Arkansas River at the edge of a large wheat field is a large washed area, which produced flint and sandstone debris. The wheat is thick and little material could be located in the field. However, a large area of the field produced the flint chips and the sandstone. This site is near a fairly large creek which flows northward along the western boundary of the site. No worked materials were found on the surface (1952:13).

The slope on which the site is located is now covered by grasses and shrubbery and is being progressively eroded away where it fronts on the Arkansas River. The site was chosen nonrandomly for study because it is one of Brighton's elevated sites which the lake has not serious disturbed. We were interested in the condition of the site after 27 years. The original habitat of the site was Grassy High Terraces and Slopes.

No artifacts were observed on the surface of the slope or in the tailings of roden burrows scattered about the slope. Along the west beach there is possibly a very thin scatter of fire-cracked rock, but no obvious artifacts were observed. Excavations were confined to 12 nonrandomly placed shovel pits along the spine and sides of the slope. Below a 5 cm thick layer of humus, the available soil matrix for a deposit varied between 5 cm and 25 cm. A compact red clay was encountered below the latter soil. No artifacts were observed during any of the shovel tests.

Brighton's survey map of the site suggests that a good portion of it is well above the eroded bank. The only conclusion to be drawn, therefore, is that whatever artifacts are present are scattered very thinly. Pw-29 is probably not worthy of additional attention.

Pw-83

This site consists of a rock shelter containing pictographs and the remnants of a cultural deposit--a thin deposit above the rock shelter, and a thicker and more extensive deposit flanking and in what is now the bed of a meandering creek. The original habitat was Wooded Stony Uplands or perhaps Wooded High Terraces and Slopes along the original creek. Survey notes report the presence of fire-cracked rock, debitage, and the pictographs.

Three randomly placed transects and one nonrandomly placed transect were laid out along a 100 m north/south axis. In all, only a few pieces of fire-cracked rock and debitage were observed because the majority of the squares were in the silt covered creek bottom and the dense brush of terrace remnants. Two test squares (one nonrandom) were excavated on the terrace remnants, seven shovel tests above the rock shelter, and two shovel tests in the rock shelter. All of the shovel tests above the rock shelter proved sterile as did a test square 30 m south and 60 m west of the rock shelter. The nonrandom test square was excavated on a terrace remnant 40 m west of the shelter. Fire-cracked rock and flakes were encountered to a depth of 70 cm. The shovel pits in the rock shelter soon encountered the water table and mud.

Essentially all that remains of the deposit in the rock shelter is a small oval area which has been thoroughly potted. Fire-cracked rock

and debitage were observed in the back dirt, but only a single biface fragment (Fig. 8-5d) was collected.

The significant discovery at Pw-83 was the pictographs, a rare find in north-central and northeastern Oklahoma. There are two panels within the rock shelter--one has red figures and the other has black figures. The Red panel contains two fish, two human figures, an unidentifiable quadruped, and a pair of triangles which are opposed at their apices. The Black panel is less distinct but is known to contain a "Greek cross" element, another pair of opposed triangles, and at least two human figures. Attempts to date the pictographs or identify the cultural affiliation of the artist(s) have not met with much success. Their content is not distinctive (mammoths, guns, or horses with riders are not present, for example) and they are not associated with a dated deposit. At most, what can be said is that they bear stylistic similarities to the presumably prehistoric Red Monochrome pictographs of the lower Pecos River region of Texas (Gayle Fritz, 1979, personal communication; see Kirkland and Newcomb 1967).

Pw-83 is a significant site primarily because of the pictographs. They should be drawn and photographed and additional testing should be done outside the rock shelter to determine the age of the associated deposit.

Pw-84

This lakefront site is most apparent as a 35 m lithic scatter below an eroded slope. Survey notes report the presence of fire-cracked rock, debitage, a scraper fragment, and historic trash including purpled glass. The original habitat was Wooded High Terraces and Slopes.

A grid, extending 22 m north from the waterline and 50 m from east

to west, was laid out over the site. Two transects along the east/west axis (3 m north of the waterline) were then randomly selected and collected. Unfortunately, there was dense bermuda grass and weeds above the beach and the ground visibility was reduced almost to zero. Fire-cracked rock was observed in 2 of the 44 squares which were inspected.

Excavations were confined to eight shovel tests along one of the surface collected transects and to a test pit in one square of the other. The shovel tests every two meters proved sterile. In contrast, the test pit revealed a 30 cm deposit containing debitage as well as a piece of clear bottle glass and many badly corroded bits of wire nails. A third of the nail bits and the bottle glass were found in the upper 20 cm; the remaining nails and the chipped stone debris were found 20-30 cm below the surface. The 20 cm below the cultural debris proved sterile.

The data recovered from the site survey phase and from the test excavations are inconclusive, raising more questions than they answer. The purpled glass suggests that there is a historic component dating to the turn of the century (Fig. 7-1). However, the temporal relationship between the glass and nails and the debitage is still unclear. Either there are mixed prehistoric and historic components or Pw-84 is the site of a turn-of-the-century Indian village. Thus, while the survey notes indicate that the site is badly eroded--perhaps 75% destroyed--a call for additional testing is perhaps not unwarranted.

Pw-85

This site is most apparent as a beach scatter below an eroded bank. Survey notes report the presence of fire-cracked rock, debitage, a projectile point tip, a broken scraper, and a pecked, groundstone fragment.

The 150 m site is presently bisected by a small cove. The original habitat was Wooded High Terraces and Slopes.

A 100 m east/west axis--essentially paralleling the beach--was sighted in west of the cove, which bisects the site. Two randomly placed north/south transects were laid out along this axis and collected. Both extended from above the bank to the waterline and both proved sterile. A randomly placed test square excavated above the bank and near the western end of the east/west axis also proved sterile. Another square, nonrandomly placed at the eastern end of the axis, contained a diffuse scatter of fire-cracked rock between 10 and 50 cm below the surface. Approximately 10 cm of sand is present above the artifact-bearing soil.

Insufficient work was done at this site to estimate the size of the remaining deposit and evaluate its integrity. However, it does not appear that the beach scatter extends around the small cove as it does at some other sites. It may be inferred, therefore, that most of the site has been eroded away. No temporally diagnostic artifacts were discovered. Additional work is not called for at this site.

Pw-86

This site is located at the tip of a steep-sided peninsula. Artifacts are visible on the narrow beach, at places 3 or 4 m below the tableland of the peninsula, and in sloughed off soil at the base of the bluff. The original habitat of the site was Grassy High Terraces and Slopes.

While the beach and the slump deposits were inspected for diagnostic artifacts, surface collection and testing within a grid system was confined to the tableland within 30 m of the peninsula tip; the maximum

width of this area is approximately 20 m. Surface collection proved impossible due to the heavy cover of blue stem and shrubbery. Test pits were excavated near the tip of the peninsula and 30 m northward near the western edge of the tableland. In both randomly placed pits, fire-cracked rock and sparse amounts of debitage were found from just below the surface to a depth of nearly 30 cm. The concentration of debris was denser at the peninsula tip, and particularly 20-30 cm below the surface.

Artifacts discovered below the tableland include a small Gary-style projectile point (Fig. 8-3d), which was found in soil held by the root mass of a tree which had lost its foothold and slid down the bluff toward the beach, and a biface fragment (Fig. 8-5c), which was found on the beach. Survey notes also indicate that artifacts, eroding out of a lake level deposit, were observed approximately 100 m northeast of the peninsula tip. It is not clear, though, whether these artifacts are eroding out an intact deposit or whether they are eroding out of sloughed off soil from the tableland above. Informant 9a has indicated that the peninsula was once much broader at its tip than it is today.

In a casual conversation, another informant (no name was taken) indicated that the Pw-86 area had been farmed at one time. This means that at least the upper portion of the deposit may be disturbed. In that the deposit is probably disturbed and nothing out of the ordinary was discovered in the test pits or on the surfaces below the tableland, it is not recommended that additional excavations be conducted on this site. The one exception might be to test the lake level deposit northeast of Pw-86 at a time when the lake is at its lowest ebb.

Pw-87

This lakefront site is within a popular recreation area and is

largely covered with planted grass and gravel. Artifacts are visible on the narrow beach below the site and to the trained eye in sparser patches in the planted ground cover. Survey notes report the presence of fire-cracked rock, a sandstone abrader, a bifacial mano, and a metate fragment. Informant 7 reports having collected a whole point and several fragments, a scraper, several knives and several manos. The original habitat was Grassy High Terraces and Slopes.

The site is on a point originally above the confluence of two streams. A grid was laid out over the site from a baseline extending 50 m westward from the point. Two randomly placed north/south transects were then selected and collected. Seven pieces of debitage were found in the 93 squares which were inspected. A single randomly placed test then was excavated 18 m west of the point and near its center. Fifteen centimeters of a brown silty loam containing fire-cracked rock and one flake were found to overlie a sterile red clay.

The age and cultural affiliation of Pw-87 are unknown, although the projectile points possessed by Informant 7 might shed some light on these problems.With respect to the integrity of the deposit, the site was probably graded before it was seeded and some of the deposit may have been stripped away or moved about the site. As sites with thin, diffuse deposits are common in the project area, no additional excavation is recommended for Pw-87.

Pw-88

This site is most apparent as a thin beach scatter which extends along one side of a cove for approximately 200 m. Survey notes report the presence of fire-cracked rock, debitage, flake cores, unidentified bifacial tools, and undiagnostic ground stone. The original habitat was Grassy High Terraces and Slopes.

Work at this site concentrated along the northern 106 m where the artifact concentration was the greatest. Inspection of the slope above the mud beach indicates that the site has been completely eroded away, leaving only the beach scatter as evidence of its existence. Auger tests along the top of the slope (3 to 10 m from the beach) indicate that nothing remains below the surface. Several transects were laid out across the slope and the beach but only a few scattered pieces of fire-cracked rock and debitage were observed. Artifacts above the beach have undergone deflation to the present clay surface or were carried there by fishermen who frequent the cove. Grab-sampled artifacts from the beach scatter include four cores, a plow-scored (?) piece of sandstone, a Gary-style point (Fig. 8-3a), a possible Gary point fragment (Fig. 8-4a), and a triangular knife (?) (Fig. 8-5b).

A walk south along the cove indicated that the remainder of the site is also severely eroded. While there may remain remnants of the intact deposit above the beach, the beach scatter itself suggests that the deposit would be thin and the artifacts diffuse. Water action, primarily, but also perhaps agricultural activity and the construction of an old county road through the northeastern edge of the site, have contributed to the near total destruction of this site. No additional work is recommended.

Pw-115

This site was reported by an informant (4) who said that when the lake pool was low one could reach down into the wet sands of this dune area and pull up human bone. A Fresno point of thermally altered Kay County chert, a Maud point (Fig. 8-3i), and two fragments of infant cranial bone were discovered by survey teams which subsequently visited

the site, although attempts to discover the buried bone met with failure.

Research during the testing phase was confined to a brief visit by an auger team. Seven nonrandomly placed pits were bored and each produced nothing but sterile sand. One pit was bored on the spot where the Fresno point and the cranial bones were discovered. Unfortunately, rains and a rising lake pool turned part of the site into an island and inundated another part before systematic excavations could be carried out. Work at this site was not completed.

Inferences about Pw-115 must necessarily be confined to the habitat, the age of the site, and to the activities on the site. The only activities inferrable from the evidence are burial and hunting or burial with grave goods. Both are indicative of a Plains Village component.
The habitat was probably Wood High Terraces and Slopes, which may explain the presence of the dunes. If the dunes are old, then the artifacts may represent a dune site occupation. If they are not old, then the presence of the artifacts is more difficult to explain. It is possible that the bone may have floated onto the site, but surely not the points.

Tu-23

This site consists of a dry, cultural deposit within a rock shelter and an exposed deposit in front of the shelter and across a small creek. The original habitat of the site was Wooded Story Uplands.

The rock shelter itself measures a maximum of 8.5 m from the drip line to the back wall. Depending on how thick the prehistoric deposit was, anywhere from 13 m to 20 m of the shelter may have been habitable. The height of the ceiling was at least 1.6 m at the back of the shelter. The slope in front of the shelter is covered with trees and grasses, several boulders--one of which contains a bedrock mortar--and a dense

concentration of fire-cracked rock. Across the small creek is a narrow, grassy terrace with fire-cracked rock and debitage eroding out along the creek. The area of this deposit is probably no more than 15 m^2 and its depth no more than 25 cm.

The most notable feature of this site, however, is the "dry" deposit which is at least a meter above the creek bed and thus probably only infrequently inundated. In this deposit, it is highly probable that, in addition to the ceramics and bone which are known to be present, seeds, wood, and fiber also are preserved. Unfortunately, as much as 75% of the deposit already may have been destroyed by pothunters. Just how much of the deposit has been potted is difficult to determine from surface evidence alone because during the periods of inundation the piles of backdirt have been leveled off and the pits filled in. Perhaps the only portion of the deposit which is still intact is that protected by roof fall. Even it is in danger, however, as pothunters have attempted--thus far, unsuccessfully--to burrow under the roof fall. In a recent pit at the rear of the cave, pothunters encountered bedrock or roof fall at approximately 75 cm below the surface.

A test pit was begun at the mouth of the shelter but work was terminated at a depth of 10 cm because the soil was disturbed. Below a deer astragulus, broken bone awl, shell-tempered potsherd, several flakes, and an old 12 gauge shotgun shell cartridge was found a green plastic fork. It was decided by the team that further excavation at Tu-23 should be postponed until careful spatial controls could be instituted.

Fortunately, several other temporally diagnostic artifacts were later observed in the collection of informant 7, who claims to have discovered them in the back dirt of pits and in the gravels below the shelter.

Temporally diagnostic artifacts in the collection include shell tempered pottery, a Fresno point, and a Reed point. All three artifacts point to a Plains Village component. Other artifacts in the collection are a small Gary point, scrapers, knives, a core, a combination mano and cup stone, and three chunks of hematite.

In conclusion, the artifact assemblage at Tu-23 is probably indicative of a Plains Village component, a varied set of activities, and a pattern of occupation that was more than transitory. With its deep, dry deposit, Tu-23 is certainly worthy of additional attention.

Finally, there are the recommendations of the testing team which are as follows:

People going to the shelter should:

--beware of scorpions (seen in November)
--beware of rattlesnakes (seen in October)
--bring strong light
--bring camera with tripod or good lighting.

Cr-73

One additional site was tested even though it was not one of the 31 sites selected randomly or nonrandomly through the sampling procedure. Cr-73 is located on the tip of a peninsula formed by a meander of a fourth order stream. The original habitat was Bottomland and Low Terraces. Three low, circular mounds comprise the distinctive features of the site. Given the additional artifactual evidence on the site of a Plains Village component (Table 7-6), it was hypothesized that the mounds might be the remains of a small village. The purpose of the excavations was to determine if the mounds were natural or man-made.

The west and south mounds were tested. The west mound is near the tip of the peninsula, and a 50 by 50 cm pit was excavated on its southeast

side. The soils revealed in this excavation consisted of a sterile, undifferentiated, sandy loam over a sterile clay of indeterminant depth. The south mound is located approximately 40 m to the southeast of the west mound. Excavation on the south mound consisted of cutting into a large rodent (?) burrow and troweling through the tailings which were present. Again, no artifacts were discovered.

The results of the test excavations suggest that the mounds are natural rather than man-made. As the south mound is now, probably each of the mounds was covered in the past with grasses or shrubbery. The root systems of this vegetation probably held the soil in place as the surrounding soil was eroded away by water action. The present low mounds were the result.

Summary

Systematic collections and/or test excavations were undertaken at 25 sites for the purposes of determing the (1) depth, (2) thickness, (3) areal extent, and (4) integrity of each cultural deposit, and the (5) age, (6) cultural affiliation, and (7) "function" or activity-type of each site. Temporal constraints forced procedural modifications most affecting the number of pits which were excavated on each site. This in turn inhibited our attempt to determine the areal extent and integrity of each deposit. Most deposits proved to be thin with a diffuse artifact content, As a result, little information beyond that already acquired during the survey phase as learned about the age, cultural affiliation, and activity-type of most sites. The depth and thickness of each deposit was probably determined most sucessfully.

CHAPTER 9

CULTURAL-HISTORICAL SYNTHESIS FOR THE KEYSTONE LAKE PROJECT AREA

Cultural remains around Keystone Lake suggest that the project area has been utilized, at least intermittently, since the Paleo-Indian Period. The quality of the evidence for each period is highly variable, although it is poor generally for the prehistoric periods which are known largely from picked over beach scatters below buried sites.

Paleo-Indian Period (10,000 B.C.-5,000 B.C.)

The evidence for Paleo-Indian utilization of the project area is limited to finds of isolated projectile points along the lakeshore and in the gravels below Keystone Dam. It is possible that some of the points, which include both fluted and unfluted styles, may have been washed into the project area, but the concentration of points found below Keystone Dam by informants 5a and 5b and others increases the likelihood that there are sites in the project area. The one site recorded which may have a Paleo-Indian component (Pw-89) was located in the Wooded High Terraces and Slopes habitat. Why additional sites were not discovered or reported by informants is not readily explainable, unless the sites are deeply buried or there was a preference for the Bottomland and Low Terraces habitat which is largely inundated. The projectile points imply a hunting and gathering economy.

Archaic Period (5,000 B.C.-A.D. 1)

An Archaic population was clearly present in the project area from at least the late Paleo-Indian Period to probably well into the time frame of the Plains-Woodland Period. Projectile points, again, are the primary indicators of the period. In contrast to the Paleo-Indian points, Archaic points are regularly discovered on beach scatters below obvious sites. The four recorded sites with definite Archaic components (Cr-103, Pw-117, Pw-161, and Pw-162) are located in the Wooded High Terraces and Slopes habitat which is probably an optimal environment for hunters and gatherers. A majority of the remaining sites which may be of either Archaic or early Plains-Woodland age are found in the same habitat. Activities indicated by the artifacts on the definite Archaic sites are cooking, manufacturing and repairing lithic tools, hunting, and quarrying or gathering midden rock and perhaps rock for tool manufacture. Manos and metates are confined to sites which may be of either Archaic or early Plains-Woodland age.

Plains-Woodland Period (A.D. 1-A.D. 900)

Most Plains-Woodland sites were identified by projectile points, although cord marked pottery was observed in several informant collections and actually traced to two sites (Pw-54 and Pw-92). While manos and metates were observed on or reported for a number of Plains-Woodland sites, no direct evidence of horticulture was discovered. Sites, whether early or late, appear to be concentrated in the wooded habitats with the greatest number being found on wooded high terraces and slopes, a habitat, again, best suited to hunters and gatherers. There is no information about the

duration of occupation of Plains-Woodland sites or about the structures and features on the sites. No mounds were recorded. Exotic trade items possible associated with the Plains-Woodland Period are limited to obsidian which was observed in a private collection (10).

Plains Village Period (A.D. 900-A.D. 1600)

At least "early" or prehistoric Plains Village sites are present in the project area. The primary indicators of the period are, again, projectile points, although a small amount of shell tempered pottery and a small number of exotic artifacts (e.g., Harahey knives, T-shaped pipes, and Caddoan pottery) have been observed in private collections. One-half of the definite Plains Village sites are located in the Wooded High Terraces and Slopes habitat. The remainder are distributed among the Bottomland and Low Terraces habitat and the Wooded Stony Upland habitat. Sites which may be either Plains-Woodland or Plains Village in age are found in three of the five habitats--Bottomland and Low Terraces and Rolling Prairie are the exceptions. Evidence of agriculture is confined to a single polished stone hoe from a site (Pw-154) in the Grassy High Terraces and Slopes habitat. There is no direct evidence of settled village life, although the burials and exotic artifacts reported for a "cluster" of sites between Pw-94 and Pw-154 are at least suggestive of a sedentary lifestyle.

Historic Period (1600's-Present)

Both Indian and Anglo-European populations have occurred or utilized the project area during the Historic Period. Documented Indian sites

consist of "villages" at Cr-81 and in the vicinities of Pw-134 and Pw-139 and two cemeteries (Pw-133 and Tu-38) with extended burials and headstones.

Anglo-Europeans entered the project area at least as early as 1806. Dated sites are post-Civil War in age and appear to represent farming, ranching, and oil industry activity. The history of the project area is outlined in greater detail in Chapter 4.

CHAPTER 10

RECOMMENDATIONS FOR FUTURE RESEARCH

Aside from the additional field work called for in the mitigation proposals of Chapter 14, several types of investigations were undertaken which deserve supplemental attention. Also, several collateral investigations which were not initiated because of the constraints of time, funding, and project scope are discussed. The additional research called for in this chapter may produce much information useful to the interpretation of history and prehistory in the project area.

Supplemental Investigations

1. Interviews should also be continued with the pre-lake residents of the area. These individuals possess a wealth of historical--if not always entirely accurate--information and they are, for better or worse, the single most important source of information about permanently inundated prehistoric and historic sites.

2. Interviews with non-scientist collectors should be continued primarily for the purposes of locating additional sites, describing and classifying their collections, and matching specific sites with diagnostic artifacts. Photographic records of such collections might be made, if the collectors are cooperative.

3. Sites which were identified by informants but which either were not visited because of the lack of time or could not be found should be searched for in January and February when the reservoir pool is at its

lowest ebb. As informant maps and verbal descriptions of location are sometimes not very precise, at least 50 m either side of the supposed location should be inspected. Sites which fall into this category are listed in Table 10-1.

4. One area which was not surveyed because of high water was the mud flats north and northeast of Cleveland. These mud flats should be surveyed in the months of January and February when the reservoir pool is at its lowest ebb.

5. Investigation of the distribution and ages of the paleosols in the project area should be continued. Level surveys beginning at the heads of valleys are called for, as are attempts to date localized exposures archeologically. Sites, otherwise undatable except perhaps through costly excavation, may be provisionally dated through their stratigraphic position relative to a dated soil horizon.

Collateral Investigations

1. The artifacts collected during the Brighton and Hofman suveys should be analyzed. The former collection, in particular, probably contains many temporally diagnostic artifacts.

2. The source(s) of the many and typologically- and temporally-varied artifacts found by non-scientist collectors (5a and 5b in particular) in the gravels below and within one-half mile of Keystone Dam should be discovered. A study of their morphology, distribution, and geological context might permit the determination of whether the artifacts have recently eroded out of intact deposits or out of soils disturbed or laid down in the course of constructing the dam, or whether over the centuries they have washed down the Arkansas and the Cimarron, perhaps from localities distant from the project area.

Table 10-1. Informant Reported Sites Either Not Found or Not Visited

Site No.	Not Found	Not Visited
Cr- 81	x	
Cr-117	x	
Cr-128	x	
Cr-130	x	
Cr-137	x	
Os-339	x	
Os-349		x
Os-352	x	
Os-363	x	
Os-364	x	
Os-370		x
Os-371		x
Os-372		x
Os-373		x
Os-376	x	
Os-379		x
Os-380		x
Os-382		x
Os-383		x
Os-389	x	
Os-390	x	
Os-392		x
Pw- 99		x
Pw-101	x	
Pw-102	x	
Pw-116	x	
Pw-118	x	
Pw-123	x	
Pw-130	x	
Pw-132	x	
Pw-140	x	
Pw-146	x	
Pw-150	x	
Pw-151	x	
Pw-152	x	
Pw-154		x
Pw-157	x	
Pw-161	x	
Pw-163	x	
Pw-164	x	
Pw-166		x
Pw-167	x	
Pw-169	x	
Pw-170	x	
Tu 25	x	

3. Broad valley and upland expanses which are uniformly covered with vegetation, humus, silt, or shifting sand should be shovel tested systematically. A comprehensive sampling program designed around a grid or transect system would almost certainly add to the known site population of the project area and to a fuller understanding of the settlement pattern within it.

4. Test excavations should be conducted on a statistically-derived sample of the scatters of fire-cracked rock found throughout the project area. Are they the product of natural forces--e.g., differential erosion, oxidation, or forest fires--or are they products of prehistoric or historic human activities? These scatters are discussed in Chapter 7.

5. Several localities where sites are concentrated should be studied in conjunction with a cross section of the lesser populated localities to determine whether the site concentrations reflect optimal habitats prehistorically or perhaps merely the fortuitous juxtaposition of site-bearing soils and the normal low water pool of the reservoir. These localities include the area between Os-12 and Os-332, between Pw-94 and Pw-154, between Os-22 and Os-375 and north to the project boundary, between Cr-78 and 138, and the entire peninsula below Pw-141. This project calls for a multi-disciplinary archeological program.

6. A bluff-top survey should be conducted wherever the project area does not extend onto the uplands. A few sites, like Brighton's Tu-2, may have been limited-activity sites.

> The top of Round Mountain produces several natural formations of sandstone, which could easily have been utilized [in a local Civil War battle] as fortifications. In the center of the abuttments is a semi-sunburst arrangement of stones on a large flat stone. This feature suggests the placement of these stones, in this pattern, was produced by man. A large central rock pointing upward and south is surrounded by radial flat sandstones, on the north half of the circle, but this is not continued on the south, giving the appearance of much wonderment as to purpose and significance (Brighton 1952:3).

Others were more likely the home base of personnel exploiting the natural resources of the river and creek valleys below. One informant (16) has reported, for example, that there is a large site, known locally in Prue and Osage as "Indian Station," on the bluff west of Waresha Creek. The home of Informants 9a and 9b is located on another large bluff-top site. Clearly, any serious study of the settlement and subsistence systems of the project area must take into account the prehistoric population living along the edge of the bluffs. Also, it should be determined if these sites have been indirectly impacted by the lake and/or its utilization. If so, the appropriate mitigative actions should then be taken.

PART III. A PROBLEM IN METHOD

CHAPTER 11

SAMPLING SIMULATION PROBLEMS OF KEYSTONE LAKE

The primary objective of this study has been to replicate work done by Mueller (1974), Judge, Ebert, and Hitchcock (1975), Matson and Lipe (1975), Fuller, Rogge, and Gregonis (1976), and Plog (1976) concerning test comparisons of different sampling strategies and sampling fractions based on a known statistical population. The inventory survey of the Keystone Lake Project Area provided such a statistical population, one which could be utilized through sampling the sand surface for simple site frequency to determine which sampling technique and sampling fraction best reproduced the reality of the original survey data. In particular, it was desired to compare (1) the <u>precision</u> or variance relative to the mean of a sampling distribution (Plog's [1976:140] "squared standard error of the mean") and (2) the <u>accuracy</u> or difference between sample and population means (Plog, 1976:140) for each sampling technique and each sampling fraction. Unfortunately, it was found in practice that the characteristics of the project area and the inflexibility of the computer package severely restricted the kinds of sample units and sample techniques appropriate to an accurate prediction of the total population. This is not an uncommon situation in regional surveys and it is hoped that an appraisal of the sampling problems found in this project will lead to better samples in the future.

Sampling Methodology

Subarea

For purposes of simulation sampling, a rectangular subarea of the total project area was selected. It is 23 km in length (from north to south) and 10 km in width, and encompasses that portion of the project area illustrated on the New Prue, Keystone, and Mannford SE topographic maps, 7.5 minute series.

The subarea was chosen with a view towards maximizing environmental diversity and includes both river branches (Arkansas and Cimarron rivers) with their juncture tributaries (Salt Creek, Walnut Creek) and different river characteristics; i.e., the relatively steeper and less dissected shoreline of the Arkansas river branch compared to the twisting meanders and oxbows, low terraces, and heavily dissected shoreline of the Cimarron river branch. Additionally, the subarea includes the greatest number of sites proportionate to the total project area, all five environmental zones for the project area (defined from soil maps), and eight of nine ranked stream orders (excluding the Arkansas River below the dam; including units not adjacent to water).

Sample Units

The project within the subarea is limited in large part to shoreline strips (except for recreation areas and broad, low terraces) and is essentially linear in form or tending to linearity. It is this characteristic of linearity that limits the kinds of sampling techniques appropriate to the area. For instance, Judge and others (1975) and Plog (1976) consider transects to be the best sampling unit for estimating population parameters. It is intuitively obvious that transect samples of any size

or pattern are not appropriate for sampling the project area. Transects cutting across river branches would cut across environmental zones as well, and would not be comparable to transects cutting across smaller tributaries; transects following shorelines would not necessarily compare environmentally and would be very difficult in terms of estimating actual area. The Orme project (Fuller and others 1976) had similar difficulties which were approached by segmenting the shoreline into natural units using intermittent streams as the unit boundaries. This is similar to transects following shorelines and subject to the same problems of comparability and area estimation within the project area.

Quadrat sample units tend to be more appropriate than transects in research concerned with the effects of environment on site location by reducing environmental variation within the unit (Matson and Lipe 1975, Cheek 1977, Stewart and Hackenberger 1977). Plog (1976) finds that smaller units are more efficient than larger ones but even his smaller quadrats of 500 m^2 are too large for the Keystone project subarea with less than 10 units possible. Matson and Lipe's (1975) units of 400 m^2 would be less than 20 units of the project subarea, again because of the linear characteristics of the shoreline. Even the 250 m^2 units used in this simulation study amount to only 10% of the total units containing at least 5% of the project area and 25% of the estimated actual acreage. The complete quadrat is an undesirable sample unit, particularly because sites are commonly located on shorelines with less than full quadrat area. Cheek (1977:40-41) dealt with this problem by deleting units less than 10% and including the remaining fractional units as potential units which were sampled normally. It was decided in the present study that fractional quadrats would be used as the sample unit with the 250 m^2 unit size as

optimal (no site was larger in area than 250 m^2), since fractional quadrats could provide a rough estimate of the actual area surveyed.

Sample Techniques

Of the four sampling techniques considered by Plog (1976)--simple random, stratified simple random, systematic, and stratified systematic unaligned--only the simple random sample and stratified simple random sample techniques were considered in this simulation. While Judge and others (1975) ranked systematic transects as the most accurate and precise in their Chaco Canyon research, they ranked systematic quadrats as the least reliable. Furthermore, systematic sampling as a technique was found by Plog (1976) to be highly variable in precision (although more efficient than single random samples), and does not provide an unbiased estimate of the variance of the sample mean (Cochran 1977:223). Plog (1976) found no gain in efficiency of stratified systematic unaligned samples over simple random samples and so this technique is not considered here. Simple random and stratified random samples have been modified in this study to include an additional stratification based on quadrat fraction size, so that a "simple random" sample is actually a stratified sample and the "stratified" random sample is a compound stratification stratified on environment and then, quadrat fraction size. In puristic terms, there is no simple random sample.

With regard to the stratified (compound) random sample, a further distinction should be made in terms of the environmental stratification. It had initially been thought that the variables of stream rank and habitat could be considered together as determining the criteria for stratification, and although this proved impractical in the simulation, it remains a

possibility. The effect of this kind of stratification would be dispersion over the project area with units of a stratum not contiguous to other units in the stratum--a dispersed stratification. Later, it was decided to ignore the stream rank variable and stratify on habitat alone. This stratification would result in a unit stratification; that is, units in the stratification would, for the most part, be contiguous within a stratum (since tne variable "habitat" is contiguous). The form of stratification will vary depending on research goals but the effect of using more than one variable in a stratification will be to increase the number of strata, increase the randomness (or dispersion), and reduce the sample and stratum sizes within the strata. Reduced sample sizes and numerous strata are practical only in large populations and the decision to stratify on more than one variable will depend on the effect this has on the stratum sizes relative to sampling. Whether or not a dispersed stratification is more reliable than a unit stratification is unknown.

Sampling Fraction

In this simulation study, sampling fractions were chosen arbitrarily at 5, 10, and 20%.

Sample

When it became apparent that fractional quadrats of 250 m^2 were the only possible sample unit and simple random and stratified simple random samples were the most reliable techniques, the decision was made to compare the precision and accuracy of the two techniques for each sampling fraction from the results of 50 samples. Accuracy (the difference between sample and population means) was to be determined by the use of Student's t using the formula:

$$t = \frac{\overline{X} - \mu}{s_{\overline{X}}}$$

where t is the score in the t distribution, $\overline{X}$ is the mean for the sampling distribution of means (from the samples), μ is the population mean, and $s_{\overline{X}}$ is the standard error (found by the standard deviation of the sampling distribution divided by the square root of the number of samples). Degrees of freedom are N-1 (McCall 1975). (Note: Use of the t test requires an assumption of normality and Matson and Lipe 1975:137-138 discuss why use of a binomial distribution may be preferable.) Precision involved the comparison of the size of standard error, smaller values being more precise.

A grid of 250 m^2 quadrats was superimposed on the subarea. Quadrats were numbered from west to east and from north to south; quadrats containing less than 5% project area (with the remainder either outside the boundary or submerged) were not included in the sampling universe since it was considered uneconomical to locate and survey quadrat units less than 3,125 m^2 or an area 60 x 60 m. Fractional quadrats were estimated conservatively with percentages ranging from 5-24% counted as 5%, from 25-49% counted as 25%, from 50-74% counted as 50%, from 75-99% counted as 75%, and complete units counted as 100%. These ranges underestimate the actual area to be surveyed and slightly overestimate the number of sites for a given amount of area, but by oversampling they insure that a project area is sampled minimally at the required sample fraction and provide a rough, simple estimate of the minimum amount of area covered. Actual quadrat fractions would result in too many strata; estimates rounding up on ranges would overestimate the actual area surveyed and tend to underestimate the number of sites for a given amount of area. Quadrat fraction is an undesirable stratification in that it tells nothing about the population, only making it possible to sample each fraction size proportionately (and consequently

the proportionate project area as opposed to a simple random sample of mixed fraction sizes). Presence or absence of sites in a quadrant is assumed in this analysis to be unrelated to quadrat fraction size and all units are treated equally on the variable of number of sites per unit, although some effect seems likely.

Estimation of the minimum area surveyed is relatively simple. One 250 m^2 quadrat is equivalent to 6.25 hectares. Thus, in terms of fractions:

Quadrat Fraction (1 unit)		Hectares		Acres
100%	=	6.25	=	15.44
75		4.69		11.58
50		3.125		7.72
25		1.56		3.86
5		.31		.77

In the project subarea, 127 units are complete (1960.88 acres), 199 units are 75% minimum area (2304.42 acres), 248 units are 50% minimum (1914.56 acres), 341 units are 25% minimum (1316.26 acres), 377 units are 5% minimum (290.29 acres), so that there are 1292 total units in the sampling universe (with area greater than or equal to 5%) and a minimum estimate of 7,768.41 total acres. As could be expected, the largest number of units are in the 5% category, but the greatest area is in the 75% category; in other words, the unit distribution is skewed to the smaller fraction sizes although relatively slight for 250 m^2 units. Obviously, larger unit sizes would increase this skewdness towards smaller fractions.

Sites which were bisected by quadrat margins were counted fractionally (Plog 1976) and no quadrat contained more than three complete sites. Habitats for each quadrat were determined from soil survey maps for Creek County, Osage County, Pawnee County, and Tulsa County (Soil Conservation Service, 1959a, 1959b, 1977, 1979) and correspond with habitats used in Chapter 7 of this report. In most cases, quadrats were classed by dominant habitat but in cases where two habitats occurred in equal amounts, the less common habitat was used. Stream rank order also corresponds with previous definitions except for a distinction of quadrats on the floodplain, not adjacent to water. Closeness to lowest stream order was the overriding factor.

Fifty sampling runs of each sampling fraction (5, 10, and 20%) for the simple random (stratified) samples were generated using the SPPS *SAMPLE operation (Nie and others 1975), with each quadrat fraction size selected and sampled individually; i.e., stratified and sample statistics calculated for each stratum. (The assistance of Terry Ward of the University of Tulsa Computer Center has been invaluable in programming the computer simulations.) The mean number of sites for each sample was then calculated by summing the weighted stratum means, using the formula:

$$\sum \frac{(\overline{X}_h N_h)}{N}$$

from Cochran (1977:91) where $\overline{X}_h$ is the mean number of sites for each stratum, N_h is the total number of units per stratum, and N is the total number of units for the population. Weighting the stratum means ensures that each stratum mean is considered with relation to its sample size. Statistics for the sampling distribution of means were then computed and the mean of

each sampling distribution was compared with the known population mean using the t test, as follows:

Sampling Fraction	Distribution Mean	Standard Error[2] (Variance)	t Score
5%	.1020	.00187	-.735775
10%	.1031	.00086	-.844187
20%	.1068	.00027	+.129668

(The population means equals .1065.) At α = .05, the sampling means would be significantly different from the population mean when t values exceed the limits of $\pm$ 2.407 (α = .20, t = $\pm$ 1.300), thus, the means of the sampling distribution of means are not significantly different. The fact that the 5% distribution has a lower t score than the 10% distribution may be attributable to the higher variance of the former. In terms of precision and accuracy, it can be seen that the variance decreases (increasing precision) and the accuracy increases (decreasing absolute values for t) with increasing sample fractions or sample sizes. Plog (1978:284) has already demonstrated that precision increases with increasing sample fraction and sample size.

An unfortunate aspect of the computer sampling simulation was a lack of awareness of the problems built into the SPSS*SAMPLE operation. For example, Nie and others (1975:128) observe that "since each case is considered for selection independently of all other cases, the resulting set of sampled cases will generally not be <u>exactly</u> the size specified." The effect of this is to create different sample sizes for a given stratum over multiple samples and less than the desired sample size as derived by hand from a random numbers table. With regard to the simple random simulation,

this effect probably increases variance between samples. Another problem with the computer simulation (especially compound stratifications) is that statistics for small strata with small sampling fractions commonly use zero as a divisor, causing the program to abort. Attempts to stratify on stream rank with habitat, and then habitat alone (along with the previous stratification on quadrat fraction size) were unworkable as a result of both SPSS operation flaws. This problem could possibly be adjusted in future programs by adding a fixed dummy number to each stratum which could be subtracted out in later computations.

With fractional quadrats as the only possible unit and compound stratifications unworkable at present using SPSS, why stratify? A lack of information may produce a less precise estimate of a population but the use of prior information in stratification will usually increase the precision in an estimate by reducing variation within each stratum and increasing variation between strata (Cochran 1977). Moreover, stratification can provide information about location of sites relative to environment as seen in Table 11-1. It is readily observable that the compound stratification based on both stream rank and habitat provides a better description of site location than either stream rank or habitat individually. In a research design it would only be necessary to sample once and this could easily be done by hand. Use of topographic maps and soil maps (when they exist) would produce better results than sampling of an unknown population and it is much easier to stratify before a sample has been drawn.

Concluding Remarks

An approach has been made to developing a sampling strategy for Keystone Lake and similar research projects using fractional quadrats. It

Table 11-1. Location of Sites Relative to Environment

Stream Rank

Rank	#Units	#Sites	% Sites/Units
R0	10	0	.07
R1	547	40.1	.14
R2	289	40.84	.14
R3	106	14.39	.12
R4	69	8.59	.09
R5	28	2.5	.12
R6	180	21.48	.155
R8[1]	63	9.8	

Habitat

Type	#Units	#Sites	%
E1	42	2.5	.06
E2	347	75.64	.22
E3	73	11.	.15
E4	682	41.89	.06
E5	148	6.66	.045

Stream Rank & Habitat

Type	#Units	#Sites	%
02	6	0	0
04	3	0	0
05	1	0	0
11	15	0	0
12	122	20.6	.17
13	35	3.5	.10
14	288	14.0	.05
15	87	2.0	.02
21	15	2.0	.13
22	81	25.16	.31
23	6	0	0
24	166	12.86	.08
25	21	.80	.04
31	6	0	0
32	32	7.99	.25
33	12	3.0	.25
34	42	3.0	.07
35	14	.40	.03
41	2	0	0

Table 11-1. (Continued)

Stream Rank & Habitat Type	#Units	#Sites	%
42	3	1.6	.53
43	2	0	0
44	42	3.53	.08
45	20	3.46	.07
53	1	0	0
54	26	2.5	.10
55	1	0	0
62	93	16.78	.18
63	7	2.5	.36
64	76	2.2	.03
65	4	0	0
81	4	.50	.125
82	10	3.5	.35
83	10	2.0	.20
84	39	3.8	.10

[1]Not a stream order. Code for grid units located on the floodplain but not adjacent to water.

should be noted that fractional quadrats are not a very satisfactory unit for analysis since they underestimate actual area and impose an undesirable stratification on the sample universe. However, in situations where a research area is linear or tending to linearity, they work adequately and are an improvement over arbitrary units such as clusters and natural units. Also, the problems in stratification with the Keystone subarea may have been lessened if more area (units) had been included in the analysis. In retrospect, a more flexible FORTRAN program specifically designed to draw stratified random samples would be preferable to the use of the SPSS computer package. Precision and accuracy of the simple random samples suggest that sampling fraction is related to population size, that is, larger samples may be required for small populations while smaller samples can provide a reasonable estimate for large populations. Finally, consideration must be given to the Keystone project in its restriction to a given contour interval. This bias ignores related sites underwater or above a certain elevation and confines observations to a subunit of the actual region. Population estimates based on data from this arbitrary project subunit of a region may not necessarily reflect the population for the total region.

PART IV. MITIGATION

CHAPTER 12

BEHAVIORAL PATTERNS AND IMPACT OF THE NON-SCIENTIST COLLECTOR

This chapter examines the behavioral patterns of non-scientist collectors who frequent the Keystone Lake Project Area, as well as the impact of that behavior on both the physical and contextual facets of the archeological resource base. Observations by House and Schiffer (1975:51) and Morse (1973) on the impact of collectors in northeast Arkansas are acknowledged forthwith as the impetus behind many of the remarks in this chapter. Particularly distressing is House and Schiffer's observation that, "The removal of artifacts is the single most important factor affecting the composition of populations of artifacts exposed on the surface of sites in the [Cache] basin" (1975:51).

The manner in which the interviews with collectors were conducted is described in Chapter 7.

The Non-Scientist Collector

Collectors interviewed or learned of through interviews were found to run the gamut from profiteering pothunters to avocational archeologists, with hobbyist collectors of varying degrees of sophistication filling the middle range. As a unified group, though, these non-scientist collectors were found to contrast with scientist archeologists in one pertinent respect; their obvious neglect of the empirical context or non-corporeal "affinities" (Taylor 1948:113) of artifacts collected. They consistently

failed, as all non-scientist collectors do, to record basic contextual information concerning the location of each artifact and each site relative to one or more problem-specific datum points, to the nature of the matrix in or on which each artifact was discovered, and to the nature and frequency of associated artifacts or ecofacts. Inferences by scientist archeologists are regularly founded on this sort of information, so it is most unfortunate that many times contextual affinities are irretreivably lost by non-scientist collectors because they were not recorded in the course of removing each artifact from its matrix or before removing it from the site.

Differentiating in this manner between the non-scientist collector and the scientist archeologist is thought to be particularly appropriate for two reasons. The first is that the relative attention accorded to contextual affinities by an individual is also probably an accurate indication of his theoretical preparation for "field work" and the sophistication of his field technique. These issues are of less direct concern to this chapter, though they should be cited as part of the overall difference between the non-scientist collector and the scientist archeologist.

The other reason is that the present manner of differentiation places the emphasis where the interviewer of non-scientist collectors would place it; namely, on the outcome of collecting activities rather than on the process. Baldly put, the difference between the non-scientist collector and the scientist archeologist is that, while both may collect or excavate a site and perhaps do equal amounts of damage to the deposit, the former will fail to collect sufficient information about the contextual affinities of his finds to facilitate the completion of even the most basic survey or excavation form.

Historical Recollections

The recollections that follow by no means constitute an adequate history of the behavior of non-scientist collectors in the project area. They provide, at best, an imperfect indicator of the span of time over which collecting has occurred and the varying degrees of its organization and intensity.

The first documented instances of non-scientist collectors date to the turn of the century. Bert Jordan (8) reports that cowhands, working for his father, J. W. "Cherokee" Jordan, and for the Bar X Ranch, would pick up prehistoric artifacts which abounded in many of the dry creeks in the "triangle" between the Arkansas and the Cimarron. Many of these, and some historic artifacts as well, were eventually taken to the Jordan race-track, near Cleveland, where they were informally exhibited about the grounds. Being of no particular interest to the elder Jordan, the accumulating artifacts were occasionally given by him to anyone who expressed an interest in them.

Artifacts were also collected "around 1900" by Gilbert W. Manforte while clearing grazing land along Bear Creek south of Cleveland. He reported to Brighton (1952:13) having collected chipped stone and ground stone artifacts from a site (Pw-30) which is just north of the present project boundary. These artifacts were still in his possession at the time of the interview in 1952. Brighton cites several other instances as well in which individuals--sometimes in the course of their work--collected sites on their own property. Some of these individuals, like Manforte, retained their artifacts; others, like Jordan, gave them to individuals who expressed an interest in them.

Artifacts were also collected in the course of recreational activities, such as fishing (Brighton 1952:10). It may have been in the course of such an activity "about 50 years ago on a sand bar in the Arkansas River" that Manforte discovered a Plainview point (Brighton 1952:23, Feature 23).

Several informants raised locally reported that as children, during the first three decades of the century, they collected projectile points, in particular. Brighton (1952) also cites several similar instances and no doubt collecting was a common activity among children living throughout the project area.

During the 1930s Boy Scouts from Jennings collected in the project area (11) probably in a somewhat more organized and intensive fashion than the average child. It has also been reported (4) that during the mid-1960s, as the reservoir began to fill, a favorite Sunday afternoon activity of Cleveland families was to search out and collect newly exposed sites along the shoreline.

Finally, an informant couple (2a and 2b) reported that, during the late 1960s and early 1970s, while their son fought in Viet Nam, they would relieve their anxieties through walking along the lake shoreline. Choosing a different stretch of beach each evening they would collect whatever prehistoric artifacts and historic curiosities (clay marbles, military buttons, minnie balls, etc.) they could find.

Current Activity and Its Impact

Artifact collecting by non-scientists occurs largely in the course of recreational activities, such as hiking, picnicking, fishing, and hunting, or as a recreational activity itself. Only one instance of collecting--in this instance, through excavation--solely or primarily

for monetary gain has been alluded to by an informant (5). There is little evidence of Keystone artifacts being bought and sold in the curio shops, pawn shops, antique stores, and flea markets in Tulsa and the communities surrounding the lake, all of which were visited during the course of this project. To be sure, it is not unheard of for collectors to buy and sell single artifacts or small lots of artifacts among themselves, but this activity has not yet engendered the kind of intensive and destructive collecting activities documented for nearby northeast Arkansas by Morse (1973) and House and Schiffer (1975:51-52).

Most informants demonstrated a general awareness of the illegality of collecting on federal land, and that they would be subject to penalities if caught in the act. At the same time, though, several expressed the opinion that their behavior was not wrong. If left on the sites, the artifacts they had discovered would eventually be lost as they were silted over, permanently inundated, or removed and sold by unscrupulous individuals. Their own actions, they argued, were the lesser of the evils because, after all, the artifacts were preserved for archeologists to study. A surprising number of the informants are or were members of the Oklahoma Anthropological Society and/or local archeological or historical societies. Several volunteered, perhaps somewhat defensively, that they intended to will or to eventually donate their collections to one of these societies or to a museum. All informants interviewed denied digging at sites, although such vandalism was frequently observed during the survey.

Impact on the Individual Cultural Deposit

Surface exploration by far surpasses excavation as the predominant collecting activity in the project area. On sites where surface collecting

has been inferred as many as four consequences have been observed. They are (1) destruction of the cultural deposit, (2) a mildly churned up site surface, (3) artifacts turned over, and (4) artifacts transported about the site. Damage to a deposit resulting from surface activity essentially occurs on only those sites on which the deposit is flanked by one or more eroding faces. Shoreline sites are the primary example of this phenomenon. Frequently there is evidence that collectors, in clambering up or down an eroded face or walking along its fragile edge in search of artifacts, have only served to hasten the erosion process and, ultimately, the destruction of the deposit. Of the four consequences, this one clearly has had the greatest impact on the integrity of the cultural deposit.

Otherwise, the impact of surface collecting on the cultural deposit probably has been slight. This is so for two reasons. The first is that the deposit is usually covered by at least a 5 cm buffer zone of post-settlement sand or soil which serves to shield the deposit from the destructive effects of most surface activity. The second reason is that the artifacts which are available to surface collectors are normally those which have already eroded out of a deposit and which have already been stripped of much of their context. Thus, churning up a beach scatter does not have the same effect as churning up an intact cultural deposit. At most, instances of the former have resulted in artifacts being broken and/or obscured in the mud or sand.

Similarly, the act of turning over an artifact has had no discernible impact on the integrity of the cultural deposit, particularly when the artifact has already eroded out of the deposit and tumbled down a bank. Transporting artifacts about a site, on the other hand, has only served to speed up a process already in motion, one in which artifacts are

pulled downslope and perhaps laterally by water action. At most, transporting artifacts has served to depopulate concentrations of eroded debris from which in situ activity areas might have been inferred. On-site evidence of transported artifacts consisted of specimens found on fallen trees, stumps, or elevated slabs or bedrock and of unnaturally dense and minerally varied concentrations of lithic debris. Nothing was found, however, to match the piles of discarded tools and debitage described by House and Schiffer (1975:51).

Several informants reported that, to avoid bending over unnecessarily to turn over potentially collectable artifacts, they used some sort of tined, garden-variety cultivating tool. Imprints of such tools--looking like the footprint of a one-legged, broken-toed crane--have been observed on several sites.

Evidence of excavation was discovered at only 0.05% of the sites visited by ARA survey teams. No informant would admit to this activity, although several were not above pointing the finger at other collectors. Three basic excavation techniques are suggested by the evidence. They are (1) shovel pits cut downward into the deposit visible in an eroding face, into the unexposed deposit directly behind the face, or into the eroded out cultural debris below the face; (2) caving or burrowing into the deposit visible in an eroded face; and (3) shaving the length of an eroded face with the assistance of a shovel or an adze. Evidence of the latter technique was observed most frequently, probably because the greatest area of the deposit could be exposed for the least expenditure of energy--every whack at the eroded face exposes more of the deposit.

Shovel pits, however, are probably the most destructive in the long run. Beside the wholesale removal of a "block" of the deposit, there is

the increased threat of erosion if a pit is not back filled, which it rarely is.

Finally, there is a fourth technique which is perhaps best described as an antecedent to excavation. This is the use of a "poke" or sounding rod to probe a site. In the Southwest the sounding rod is used with frightening efficiency by collectors to locate burials which may contain funerary items. No evidence of this technique was observed during the survey, although use of the sounding rod was reported by several informants. The impact of its use on the integrity of the deposit is minimal.

Impact on the Artifact Population of Individual Sites

Several collectors reported that they, or someone else they knew of, collected all of the observable tools and debitage from each site. Judging from the collections observed, however, this practice is clearly the exception rather than the rule. Most collectors concentrate on exotic artifacts and a few of the more common and easily recognizable classes of artifacts, the projectile point being the most notable example. Lacking tabulated data on collector preferences, the ranked artifact classes of Table 12-1 are at best impressionistic. Nevertheless, six ranks are distinguished, I being the most preferred and VI the least preferred.

The implications of the ranked classes for the artifact populations of project area sites are clear, however. The fire-cracked rock, debitage, and ground stone fragments which are most commonly found on sites are the skewed remains of a not so random collecting strategy. The exotic artifacts and points which were found on all but the most inaccessible sites by ARA survey teams are probably those which had only recently eroded out of a deposit or which were uncovered through the action of water or wind on the loose sands and silts of beach scatters.

Table 12-1. Artifact Preferences Among Non-Scientist Collectors

I
Beads
Bifacially flaked preforms and tools, e.g., projectile points and knives
Bone tools
Ceramics
Exotic ground stone, e.g., celts, pipes, and bannerstones
II
Projectile point fragments
Retouched flakes
III
Cores
Manos
Nutting stones
IV
Mano fragments
Metates
V
Debitage
VI
Ecofacts
Fire-cracked rock
Manuports, e.g., unutilized chert nodules

Impact on the Area-Wide Population of Surface Artifacts

The remarks of this section pertain largely to the impact of collecting on the population of surface artifacts in the whole of the project area. There was not sufficient evidence of excavation found or reported to indicate that more than one small but significant class of sites, rockshelters, has been severely effected by excavation activity (Chapter 7).

Nearly the entire land surface of the project area is open to collectors. The likelihood, therefore, that a site will be collected is, to a large extent, a function of the collector's ability to identify the site and reach it. In turn, the productivity of a site is, to a certain extent, a function of the collector's ability to take advantage of certain variables, such as a rainfall or a dramatic change in the elevation of the reservoir pool. Non-scientist collectors were found to vary respectively in their techniques and in their efficiency, and thus in their individual impact on the area-wide population of surface artifacts.

The majority of the acts of collecting in the project area probably represent no more than a momentary diversion in which an individual stumbles onto and collects the surface of a site and then returns to some planned recreational activity. Thereafter, the individual might return to the site, if he does so at all, only intermittently, as on those occasions, for example, when he is already in the vicinity. Over the years, the impact of one such collector might be considerable, but it would likely be so only for a miniscule number of sites. Properly regarded, the impact of this largely hypothetical pattern of behavior--namely, itinerant, intermittent surface collecting--on the surface population of artifacts only assumes dire proportions when the discrete instances are considered collectively. No doubt the hundreds, if not thousands, of

instances of this pattern which probably occur yearly in the project area are at least partially responsible for creating and perpetuating the same sort of artificially skewed artifact population only projected for northeast Arkansas by Morse.

> Morse (personal communication) has suggested the possibility that as this collecting activity continues, the potential surface lithic collections from most sites will tend to look pretty much the same. These samples, no matter what the cultural-historical stage or occupation or the nature of past cultural behaviors at the site, would consist of flakes, chips, quarry waste, and fire-cracked rock (House and Schiffer 1975:51).

Unquestionably, though, the greatest short-term and continuing threat to the integrity of the population of surface artifacts comes from a much smaller contingent of dedicated collectors, who live for the most part in the towns bordering on the lake. These individuals regularly collect in the evenings and on weekends. They often belong to informal collector networks, the members of which occasionally collect together and trade artifacts and information among themselves. Additionally, they consciously attempt to maximize the fruits of their efforts through incorporating one or more of the following techniques into their collecting strategies.

1. Visiting productive sites or stretches of shoreline repeatedly.
2. Visiting productive locales after a hard rain.
3. Using a boat to reach relatively inaccessible sites.
4. Using a boat to lessen the travel time to and between sites.
5. Visiting productive locales following a dramatic change in the elevation of the reservoir pool.
6. Intensifying the search when the reservoir pool is at its lowest elevation during the winter months of January through March.
7. Systematically exploring sandy beaches, points at the mouth of inlets, and anywhere there is evidence of fire-cracked rock.

8. Searching in the gravels and among the boulders below the Keystone Dam spillway when water is not being released.

Shorewalkers outnumber boaters and in the aggregate they probably have had the greater impact on the population of surface artifacts. Boaters, however, have the advantage of exceptional mobility and, on a given day, a well-prepared collector working from a boat can have a tremendously detrimental impact on the population of surface artifacts. One particularly successful collector (7) has combined the use of the boat with systematic exploration of the shoreline and repeated visits to select sites. Over a period of years he has amassed a catalogue of 81 sites, a good percentage of which he can probably visit in a single weekend, if not in a single day. He has also amassed a large collection of artifacts from sites bordering on nearly every navigable portion of the lake, where, *unfortunately*, the most sites are found anyway. Table 12-2 indicates the striking differences in what he found and what ARA survey teams subsequently found on some of the same sites. If the table could indicate, as his site notes do, the number and variety of artifacts found during each visit to the sites, it would also serve to illustrate the part determined collectors have played in creating and perpetuating an artificially skewed surface population of artifacts.

Impact on Artifact Context

This chapter began by suggesting that non-scientist collectors failed to record adequately the contextual affinities of their finds and thus were responsible for the loss of a significant body of archeological data. This discussion of the impact of the non-scientist collector cannot be concluded, therefore, without giving some attention to the evidence on which the foregoing charge is based. The subject is the organization of and the documentation for private collections.

Table 12-2. Comparison of Survey Accounts of Artifacts and Informant 7's Collection

Site	Cr-71		Cr-135		Os-22		Os-374		Pw-54		Pw-81		Pw-125	
Artifact	ARA	7	ARA	7	ARA	7	ARA	7	ARA	7	ARA	7	ARA	7
Fire-cracked rock	x		x		x		x		x		x		x	
Debitage	x		x		x		x		x		x		x	
Projectile point		x		x	x	x		x	x	x		x		x
Scraper				x		x		x		x		x		x
Graver		x												
Knife		x		x		x		x		x		x		x
Utilized flake		x												
Core		x		x	x			x		x				
Hammer		x				x				x		x		
Chopper		x												
Drill		x		x		x				x				
Metate				x										x
Mano		x		x		x				x				x
Mano/Cup stone		x				x								
Worked hematite		x				x				x				
Pottery	x				x	x				x				
Bone or tooth		x				x				x				
Bone awl		x								x				
Antler						x								

In the typical informant collection large artifacts (e.g., manos and metates) are stored in the garage and/or exhibited in the yard and small artifacts are stored in bulk in coffee cans, cigar boxes, and the like. Sometimes finely worked specimens, stylistically similar points, or even the first point ever found are placed in frames and exhibited. Artifacts are neither grouped by site nor labeled individually. Quite regularly, specimens from outside the project area and even the state are included in the same container and more than once an informant was hard pressed to remember which artifact came from where.

Claims by informants that they could locate the sites from which their artifacts were removed for the most part far exceeded their ability to do so. Specimens significant in their own minds were located most easily, though even then locating a site precisely on a topographic map often proved a difficult task. (Several informants allowed that they were confused by the topographic maps and that they could do better if they were on the lake.) When questioned about the remainder of their artifacts, the latter were generally dismissed as coming from one part of the project area or another, if that much was known about them.

Only four of the informants interviewed keep some kind of record of where the sites they have collected are located. Two label their artifacts using a memory-retained code. One code (6) specifies the region (e.g., Appalachia Bay) but not the specific locale of the site. The other (1) indicates specific locales through numbers or letter combinations, though neither correspond to any geographical names or landmarks known to the author. They are also apparently confusing to the informant who several times had difficulty remembering where a site is located.

Neither code, to be sure, would have permitted an archeologist to place the artifacts by himself.

The other two informants keep written records as well. Couple 5a and 5b, working below Keystone Dam in the gravels, label each artifact and record the day a find is made, the time, and the location along the river bank. Their work will prove invaluable if a distributiona' study of the artifacts found below the dam is ever undertaken. The other informant (7) boxes his artifacts by site and labels each box. Each site number is placed on a simplified and high-scaled map of the sort prepared for lake visitors by the Corps (see Department of the Army n.d.).

No other informant collecting surface artifacts so consistently and clearly records the location of his artifacts. At the same time, though, he does not record the environmental setting of each site, the nature of the matrix on which each artifact is found or out of which it eroded, the associated artifacts (gross associates can be inferred from the catalog of artifacts for each site), and whether fire-cracked rock is present. Thus, the information he records is still insufficient to complete even the most basic site survey form.

CHAPTER 13

INUNDATION IMPACT ON ARCHEOLOGICAL SITES IN THE KEYSTONE LAKE PROJECT AREA

Only recently has much work been done in the area of inundation impact prediction for archeological sites (e.g., Brauner, Hammatt, and Hartman 1975; Lenihan, Carrell, Hopkins, Prokopetz, Rayl, and Tarasovic 1977). The final report of the National Reservoir Inundation Study, sponsored by several federal agencies, is still in progress.

The archeological survey of areas which have already undergone reservoir inundation poses related but different problems than pre-reservoir surveys. Such surveys observe only after-the-fact conditions. Unless pre-inundation archeological data are available, reservoir impact can be estimated only through the use of a reconstructive model. Adaptation of predictive models can be used in developing such reconstructions. The development of more comprehensive predictive models will be of great value in impact reconstruction. This discussion is meant to serve as a beginning point and stimulus for future research on these topics.

The basis for the following study is the National Reservoir Inundation Study's inundation impact prediction model for archeological sites (Lenihan and others 1977:18-23). However, certain modifications of the model, specified below, were necessitated by the circumstances of the Keystone Lake situation, particularly by the fact that this is a post-inundation study. Regardless, the general outlines of the model are

followed to produce an index of the relative susceptibility of sheet eroded sites in the lake's floodpool. Sheet eroded sites comprise about 75% of the sites in the sample population. The resulting susceptibility values for each of the sites fall into three main groups. This information will be considered in recommending further archeological work. The susceptibility of the remaining sites, which are impacted more by bank erosion or by silting than by sheet erosion, are considered only in general, not on a site-specific basis.

The data base for this study consists of the 187 sites recorded at the time of this writing. Because this chapter is concerned solely with reservoir impact, sites which are not in the Keystone Lake floodpool are not discussed. Those sites, however, may be impacted indirectly by the reservoir through human recreational activity.

Overview of Inundation Impacts

Three general types of inundation impacts commonly recognized are 1) mechanical, 2) chemical, and 3) biological. Mechanical impact refers to the processes which disturb the physical integrity of archeological sites. Chemical impacts are concerned with the preservation of artifactual material. Biological impacts deal with the effects of macro, and micro-biological flora and fauna on inundated cultural resources (Rayl, Fosberg, Lenihan, Nordby, and Ware 1978:49, 51, 57).

Artifactual preservation is tangential to an archeological survey, and chemical impacts are therefore not discussed. For similar reasons, no study of biological impacts was made. This study of inundation impacts is therefore concerned solely with mechanical impact.

The National Reservoir Inundation Study Model

The degree of disturbance to the physical integrity of a site depends on three variables: environmental matrix, reservoir dynamics, and cultural manifestation (Lenihan and others 1977:19). Each of the sites' variables is assigned a value ranging from 2, signifying minimal susceptibility, to 8, indicating maximum susceptibility. These values are discussed in more detail later. In order to reflect the interaction between the three variables, the susceptibility values are multiplied to arrive at a total value for each site. Since the individual values need to be multiplied, the value of 1 is not assigned to any of the variables.

Because of the vast range of potential mechanical impacts and site attributes, it is impossible to predict all the possible effects. Certain site attributes were selected to create a practical working model. In the few cases where more than one of the selected impacting processes affects a specific site, the site is dealt with as being affected only by the more severe process.

The National Reservoir Inundation Study Preliminary Report includes a chart offering predictions on the relative susceptibility of certain environmental matrices when exposed to certain reservoir dynamics. A second chart assigns relative predictive inundation impact susceptibility values to various cultural manifestations. These charts are to serve as a baseline predictive model for mechanical impact. Their assigned values are hypothetical and are currently being tested and refined by the National Reservoir Inundation Study. The purpose of the National Reservoir Inundation Study is to predict the nature and extent of various reservoir inundation impacts upon archeological sites, and to evaluate different methods of mitigation (Lenihan and others 1977:11-23).

Keystone Lake Project Area Inundation Impacts

Keystone Lake has been in operation since 1964. To assess accurately inundation impact without excavation or a control sample prior to inundation is virtually impossible. In order to estimate inundation impact, the predictive model formulated by the National Reservoir Inundation Study has been modified. The National Reservoir Inundation Study is hereafter referred to as the NRIS.

In the original NRIS, the positioning of each site relative to the river is recorded, in order to reflect relative susceptibility to erosion due to river velocity. Those sites located on the outside of a river meander are awarded a high susceptibility value, sites situated along a relatively straight stretch are assigned an intermediate value, while sites on the inside of a river meander are assigned a low susceptibility value (Lenihan and others 1977:20).

This variable, however, was not used in the present study, as the vast majority of the sites recorded on or near the active shoreline are very close to a small tributary. The confluence of a tributary with a river typically produces a silt delta. Sites situated close to such a delta would thus be somewhat protected, rendering the river-positioning variable less significant. The recording of such a high percentage of sites at a confluence may be a combination of prehistoric locational preference, improved site visibility, and differential site preservation.

In the NRIS model, relative site impact susceptibility values are assigned to the relevant environmental matrices, or soil types, and to selected reservoir processes such as the frequency of inundation. The scores given in the NRIS model are a composite of the susceptibility of specific soil types to specific reservoir conditions. The NRIS preliminary

report does not provide sufficient pertinent data for direct application of environmental matrices' susceptibility values to the soil types of the project area. Therefore, an erodibility index was adopted to reflect the relative susceptibility of the soil matrices to erosion by water. Such an erodibility value, in conjunction with another value indicating the frequency and duration of inundation/dessication, should provide an indication of a site's susceptibility to reservoir erosion. This system is discussed in more detail later. Thus, the composite score used by the NRIS is replaced by two separate scores which are multiplied. This modification has been adopted in order to deal with sheet eroded sites, which represent the majority of sites in the study area.

Environmental Matrices Variable

The first variable of the impact model used for project area sites is the environmental matrix, or the soil in which the site was deposited. The soil types are divided into three groups according to their erodibility, or K value. The K value is a measure of the susceptibility of the soil to erosion by water (Soil Conservation Service 1979:43).

Reservoir Dynamics Variable

The second variable in this model is that of reservoir dynamics. Two main aspects were selected in order to rank site susceptibility: frequency of inundation/dessication and the period of inundation.

In addition to impact due to lake level fluctuation, considerable erosional damage to the sites has taken place as a result of rain run-off. An estimate of relative impact of run-off erosion would have to include site specific information such as soil type, slope, length of slope, and ground cover. This, however, was not undertaken, as run-off erosion is

not an impact of the reservoir project and the accumulation of the necessary data was beyond the scope of this project. Consequently, this study reflects the reservoir's impact, but not necessarily the impact of the environment as a whole.

Cultural Manifestations Variable

The final variable, cultural manifestation, refers to the physical form a site takes, such as an historic foundation or rock shelter. Each of the three general types of cultural manifestations represented in the project area is assigned a susceptibility value. How susceptibility values are assigned is discussed later in this chapter.

Interaction of the Variables

The interaction of the cultural manifestation, environmental matrix, and reservoir dynamics variables comprises the overall inundation impact susceptibility of a site. It is for this reason that the susceptibility values assigned to each variable are multiplied to arrive at a total value. The three major types of impact resulting from the interaction of environmental matrices and reservoir dynamics are sheet erosion, bank erosion, and siltation. Each of these impacting processes is different enough dynamically to warrant dealing with the affected sites separately.

Sheet Eroded Sites

Approximately 78% of the sites in the sample undergo sheet erosion, the removal of surface material by water more or less evenly from an extensive area. In order to obtain a susceptibility value for the environmental matrices of each of these sites, the soil type of each site was recorded, according to the county soil survey manuals. The soil types

on which these sites are located are divided into three groups by their K value, or erodibility. K values range from 0.10 to 0.64. Soils with the highest K value are most erodible (Soil Conservation Service 1979: 43).

K values of soils on which project area sites are located range from 0.17 to 0.37. The first group of soils includes 13 soil types with a K value falling between 0.17 and 0.24. Six of these types have a K value of 0.20, while only two soils have a K value of 0.24. Sites situated on soils of this group receive a susceptibility value of 2, indicating relatively low susceptibility.

The second group of soils includes those with a K value falling between 0.28 and 0.32. Seven of the ten types have a K value of 0.32. Sites located on these soil types are assigned a susceptibility value of 3, signifying a higher susceptibility.

The final group includes 14 soil types, all with a K value of 0.37. Sites on these soils receive a susceptibility value of 4, indicating maximum susceptibility.

Table 13-1 presents soil descriptions for soils on which sheet eroded sites are located, as well as the K value and abbreviations for these soils. The abbreviations are used in Table 13-4. These data were compiled from Soil Conservation Service publications (1959a:44, 1959b:73, 1977b:5-14, and 1979:165).

In order to reflect the frequency of inundation/dessication, a value is assigned to all sites affected by a lake level rise to specific elevations of five foot intervals from 725 to 754 feet above sea level. The normal pool level of Keystone Lake is 723'. The maximum flood control pool level is 754'. The number of times each five foot interval has been inundated is listed in Table 13-2.

Table 13-1. Soil Type and Susceptibility Values

Symbol	Description	K Value
	Low Susceptibility Group	
8	Cleora fine sandy loam	0.20
14	Darnell-Stephenville complex, 1 to 8% slopes	0.24
20	Dougherty loamy fine sand, 3 to 8% slopes	0.20
21	Eufaula loamy fine sand, 3 to 15% slopes	0.17
22	Eufaula Dougherty complex, 0 to 3% slopes	0.22
28	Konawa loamy fine sand, 3 to 8% slopes	0.17
Bc	Bates fine sandy loam	0.24
DcP	Darnell-Talihina complex, 8 to 45% slopes	0.20
Dm	Dougherty-Eufaula complex, 8 to 15% slopes	0.20
Ea	Eufaula loamy fine sand, gently sloping	0.21
Eb	Eufaula loamy fine sand, strongly sloping	0.17
Ya	Yahola clay loam	0.20
Yb	Yahola very fine sandy loam	0.20
	Intermediate Susceptibility Group	
31	Mason silt loam, 0-1% slopes	0.32
32	Mason silt loam, 1-3% slopes	0.32
35	Niotaze-Darnell complex, 3-15% slopes	0.28
36	Niotaze-Darnell complex, 15-25% slopes	0.28
37	Niotaze-Darnell complex, 25-45% slopes	0.28
Da	Darnell and Pottsville soils, sloping	0.32
Db	Darnell soils, sloping	0.32
Df	Dougherty and Stidham fine sandy loams	0.32
Dl	Dougherty fine sandy loam, 5-8% slopes	0.32
Sa	Stephenville and Darnell fine sandy loams	0.32

Table 13-1. (Continued)

Symbol	Description	K Value
	High Susceptibility Group	
3	Barnsdall very fine sandy loam	0.37
41	Norge silt loams, 2-5% slopes	0.37
42	Norge, Dennis, and Prue soils, gullied	
Dd	Dennis and Okemah loams, sloping	0.37
Nd	Norge soils	0.37
Mb	Mason silt loam	0.37
Pc	Port silt loam	0.37
Ra	Reinach very fine sandy loam	0.37
Ta	Teller silt loam, gently sloping	0.37
Tb	Teller silt loam, nearly level	0.37
Tc	Teller silt loam, sloping	0.37
Va	Vanoss silt loam, gently sloping	0.37
Vb	Vanoss silt loam, nearly level	0.37
Vd	Verdisgris fine sandy loam	0.37
Ve	Verdigris silt loam	0.37
67	Verdigris soils, broadly defined units	0.37

Values are assigned to the number of times and days each elevation range was inundated as shown in Table 13-3. Two is the lowest value assigned, as the numbers will be multiplied. With each large increase another point is arbitrarily added. The value "8" is chosen for the "days" value in the 725-730' elevation range in order to reflect the much greater impact expected for sites within the active shoreline zone. The resulting "days" x "times" value for sites in this elevation range is 32, while the corresponding value for sites in the 730-735' elevation range is 15.

Table 13-2. Number of Days (d) and Times (x) Elevation Ranges were Inundated 1965-1978

	Elevation Ranges											
	725-730		730-735		735-740		740-745		745-750		750-754	
Years	d	x	d	x	d	x	d	x	d	x	d	x
1965	48	4										
1966	48	0										
1967	60	2										
1968	45	5										
1969	33	6										
1970	50	4	8	3								
1971	3	1										
1972												
1973	193	6	131	3	98	2	79	4	53	4	7	2
1974	224	7	100	5	50	3	26	2	13	1	6	1
1975	152	3	32	5								
1976	18	2										
1977	98	3	12	1								
1978	50	2										
Total	1022	45	283	17	148	5	105	6	66	5	13	3

These data were compiled from monthly charts provided by the Corps of Engineers, Tulsa District. Charts for 1979 were unavailable at the time of publication.

Table 13-3. Elevation Range Susceptibility Values

Elevation Range	Total Times Inundated	
725-730	45	4
730-735	17	3
735-740	5	2
740-745	6	2
745-750	5	2
750-754	3	2

Elevation Range	Total Days Inundated	
725-730	1022	8
730-735	283	5
735-740	148	4
740-745	105	4
745-750	66	3
750-754	13	2

The lowest elevation point of a site believed to be <u>in situ</u> is used in placing a site in its elevation range. Sites are thereby placed in the elevation range in which they would be first affected by lake level fluctuations. This point has been estimated from site plottings on topographical maps following the field survey, and therefore may not be totally accurate.

Cultural manifestations represented in the project area are assigned susceptibility values ranging from 2 to 3. Survey teams recorded 11 standing or partially standing stone, mortar and plaster structures on sheet eroded sites. Such structures will clearly collapse once the mortar and plaster deteriorate. These structures therefore receive a susceptibility value of 3, indicating that considerable impact may be expected, relative to other cultural manifestations in the area.

Other sites recorded included a foundation associated with a considerable amount of stone and mortar rubble or brickfall, attesting to such impact. Additional sites, including foundations associated with relatively little rubble, may have been leveled by man. The removal of abandoned farmsteads is encouraged for aesthetic reasons (Pawnee County Conservation District Directors 1978:38). Such removal eliminates archeological information on super-structure construction. Once the walls have collapsed, the low-lying ruble receives an impact susceptibility value of 2.5, indicating that some additional impact may be expected beyond that which has already occurred. Keystone Lake floodpool also has historic sites with low-lying or surface sandstone and concrete foundations. This cultural manifestation is also assigned a susceptibility value of 2.5.

These values indicate the susceptibility of the structures, rather than that of the site as a whole. Should the matrix of a stone foundation, for example, be very susceptible to erosion, considerable impact to the structure in terms of displacement may be expected.

Sites appearing as a surface scatter of artifacts, prehistoric and historic, are assigned a susceptibility value of 2, as the least amount of impact is expected. As this cultural manifestation comprises the bulk of project area sites, the primary focus of this mechanical impact study will be on erosion factors relating to the environmental matrix and reservoir dynamics. Sheet eroded sites and their assigned values are listed in Table 13-4 in decreasing order of their total susceptibility rating. The total susceptibility value is the product of the susceptibility values for the sites' cultural manifestation, environmental matrix, number of times inundated, and the total number of days inundated.

Table 13-4 . Sheet Eroded Sites Listed from Highest to Lowest Total Susceptibility Value (TSV)

Site	TSV
PW-97	384
CR-112	
OS-318	320
OS-391	
PW-121	288
CR-72	
CR-75	
CR-118	
OS-324	
OS-327	
OS-341	
OS-365	
OS-366	
OS-374	
PW-12	256
PW-28	
PW-36	
PW-45	
PW-87	
PW-88	
PW-106	
PW-115	
PW-126	
PW-127	
PW-131	
PW-154	
CR-131	
OS-6	192
OS-12	
OS-313	
OS-314	
OS-321	
OS-326	
OS-330	
OS-331	
OS-335	
OS-340	
OS-344	
OS-348	
OS-378	
OS-393	192
PW-54	
PW-84	
PW-94	
PW-123	
PW-137	
PW-138	
PW-141	
PW-143	
PW-145	
PW-148	
TU-23	
TU-28	
PW-153	180
PW-168	150
CR-94	
CR-106	128
CR-107	
OS-22	
OS-228	
OS-229	
OS-310	
OS-333	
OS-338	
OS-346	
OS-350	
OS-353	
OS-358	
OS-359	
OS-362	
PW-10	
PW-81	
PW-83	128
PW-89	
PW-107	
PW-108	
PW-111	
PW-112	
PW-117	
PW-125	
PW-128	
PW-140	
PW-142	
PW-147	
PW-149	
PW-161	
PW-162	

Table 13-4. (Continued)

Site	TSV
CR-73	
CR-74	
OS-351	
OS-388	
PW-95	120
PW-96	
PW-100	
PW-114	
CR-86	96
CR-90	
CR-14	
CR-71	
CR-92	
CR-99	
CR-124	
OS-327	90
OS-329	
PW-15	
PW-120	
PW-139	
CR-102	80
CR-108	
CR-120	75
CR-121	
CR-86	
CR-91	64
CR-110	
CR-7	
CR-105	
CR-133	
OS-342	
OS-347	
OS-355	60
OS-384	
OS-386	
PW-101	
PW-144	
PW-158	
PW-159	
PW-172	
CR-109	
CR-114	
OS-317	48
OS-398	
PW-29	
PW-42	
CR-95	
CR-122	
CR-123	40
OS-369	
OS-399	
PW-113	
CR-126	36
Tu-28	32
OS-397	24
TU-27	

Results

The 145 sheet eroded sites are divided into 24 groups of total susceptibility ratings, ranging from 384 to 24 points. Nineteen percent of the sites fall into the 192 total susceptibility rating group. Most of these are historic or prehistoric scatters situated on the intermediate soil group, located along the shoreline. That so many sites should have the same total susceptibility rating is not surprising, as many sheet eroded sites are scatters, are located on the intermediate soil group, and are situated in the 725-730 elevation range. The total susceptibility of a site under these conditions is 192. Similarly, beach scatter sites on the low erodibility soil group receive a total susceptibility value of 128. Site distribution in terms of elevation range, cultural manifestation, soil erodibility, and susceptibility scores is presented in Table 13-5.

The susceptibility score distribution of sheet eroded sites falls into three main groups. Those sites with a relatively high susceptibility value of 192 or higher comprise 37% of sheet eroded sites; sites with scores of 180 through 120 comprise 29% of sheet eroded sites, while sites having a score of 96 or lower comprise 34% of sheet eroded sites. It may be noted that no sites in this last bracket are located on the active shoreline.

Bank Eroding and Silting Sites

Unlike sheet eroded sites, banked sites are impacted through erosion of soils underlying the actual environmental matrices. Information regarding the location and erodibility of different subsoils is not available. Forty-two of the 187 archeological sites in the sample floodpool population are undergoing bank erosion. Because these sites are

Table 13-5. Site Distribution Among Total Susceptibility Values (TSV), Elevation Ranges, Cultural Manifestations, and Environmental Matrices.

TSV	No. of Sites	Percentage of Sites
384	1	1
320	1	1
288	2	1
256	14	9
240	2	1
192	37	24
180	1	1
150	1	1
135	1	1
128	31	20
120	8	6
96	1	1
90	8	5
80	2	1
75	3	2
72	2	2
64	2	2
60	15	10
48	7	4
40	5	3
36	1	1
30	1	1
32	1	1
24	3	2

Elev. Range	No. of Sites	% of Sites
725-730	88	58
730-735	39	26
735-740	9	6
740-745	7	5
745-750	3	2
750-754	5	3
Total	151	100%

Cultural Manifestation	No. of Sites	% of Sites
P or Hsc	124	82
Hf	16	11
Hst	11	7
Total	151	100%

Erodibility of Soil Group	No. of Sites	% of Sites
Low	56	37
Med.	57	38
High	38	25
Total	151	100%

necessarily affected by the active shoreline, banked sites are generally very susceptible to reservoir impact. It should be noted that while these sites themselves are not at the elevation of the active shoreline, they are profoundly affected by the undercutting through shoreline erosion and subsequent site loss through bank slump.

In order to predict precisely the relative reservoir impact on banked sites, site specific data including angle of exposure, meteorological records since the construction of the reservoir, wave fetch length, vegetation, river velocity, and the erodibility value for the soil strata underlying sites, would have to be analyzed. Such an analysis is not within the score of this study. Banked sites are listed below in Table 13-6.

Table 13-6. Banked Sites Listed by Site Number

Cr-97	Os-325	Os-377
Cr-98	Os-328	Os-402
Cr-103	Os-332	Pw-85
Cr-115	Os-337	Pw-86
Cr-127	Os-343	Pw-88
Os-11	Os-345	Pw-89
Os-311	Os-354	Pw-98
Os-312	Os-356	Pw-109
Os-319	Os-357	Pw-122
Os-320	Os-358	Pw-124
Os-322	Os-361	Pw-134
Os-323	Os-367	Pw-135
		Pw-160

Eight sites recorded in the Keystone Lake resurvey are currently undergoing siltation. These sites will not be dealt with as the impact is inaccessible without excavation, analysis, and a control sample. It should be noted, however, that it has been suggested that the siltation of permanently inundated sites may be advantageous. Although, clearly, none of the sites found in the survey are permanently inundated, a similar effect might be expected (National Park Service 1978:4). These sites are listed below in Table 13-7.

Table 13-7. Silting Sites Listed by Site Number

Cr-96
Cr-104
Cr-111
Cr-113
Pw-103
P2-110

Susceptibility of Bank Eroding and Silting Sites

As previously mentioned, banked sites are highly susceptibile to reservoir impact as they are necessarily affected by the active shoreline. The 42 bank eroding sites should therefore be treated as having a susceptibility value of at least 120. In some cases, their relative susceptibility may be much greater. The eight silting sites are considered to be in the low susceptibility category due to the suggested preservative quality of sediment deposition.

Applicability of the Analysis

The most devastating reservoir impacts occur within the beach and drawdown zones, as a result of wave and current action, primarily. This refers to the 88 sheet eroded sites in the 725 elevation range and the 42 banked sites. It is suspected that "in many instances, extensive excavation of sites within the projected beach and drawdown zones might be the only way to insure that cultural resources were not irretrievably lost or destroyed" (National Park Service 1978:9). This clearly would hold equally true for cultural resources not already destroyed located in an actual beach or drawdown zone.

The NRIS Interim Report also suggests that sites within the floodpool zone be evaluated in terms of predicted floor frequency, site visibility, and anticipated recreational use impact. The floodpool zone at Keystone Lake falls between 730 and 754 feet MSL. Human impacts are discussed in Chapter 10. Keystone Lake water level predictions as supplied by the Corps of Engineers, Tulsa District, are as shown in Table 13-8.

Keystone Lake generally experiences high water levels in spring and fall. Excavation of low elevation sites should therefore be planned for either the summer months or the December through February period. Although

recommendation for testing will be made, in part, in light of this inundation impact study, it should be noted that many sites have already been so heavily impacted by inundation impact, run-off, or human impact to warrant no further work.

Table 13-8. Keystone Lake Water Level Predictions

Elevation	Percent Time Inundated
725	21
730	4
735	2
740	2
745	1
750	1/2
754	Top of Flood Control Pool

CHAPTER 14

RECOMMENDATIONS FOR MITIGATION

The survey of the Keystone Lake Project Area recorded a total of 357 new and previously discovered sites. The majority of these sites had been seriously impacted by several factors already discussed in the preceding two chapters. Briefly, however, they consist of individuals involved in recreational activities and several types of water-related erosion. These factors have resulted in the serious disturbance or destruction of perhaps 90% of the 306 recorded project area sites above the normal lake pool elevation (723 ft. MSL).

Since the majority of cultural resources in the project area have been extensively disturbed, the few sites which retain research potential assume increased importance. These few sites represent the last intact remnants of the evidence on culture history in the area, and should receive the consideration and attention that such evidence deserves.

Because of the large numbers of sites in the area, recommendations for individual sites have been grouped into several categories, starting with the most important remaining resources and proceeding to the sites which are so destroyed as to warrant no further work. The first sites to be discussed include all those which are considered to warrant inclusion of the National Register of Historic Places because of their potential to produce information important to prehistory or history. As pointed out above, the fact that these few sites still retain significant information potential makes them of outstanding importance to the resource base of the project area.

National Register Eligible Sites

Only four sites have been determined to be eligible for nomination to the National Register of Historic Places. These sites are of outstanding importance and should receive immediate attention.

Tu-23

This prehistoric site (see Chapter 8) is a rock shelter that contains a partially undisturbed deposit which is at least 50 cm thick. The deposit is apparently of Plains Village age (A.D. 900-A.D. 1600) and appears to contain organic remains. Shell tempered pottery is present. There is the possibility of a long cultural sequence in the undisturbed deposit. This rock shelter is the only site with good evidence of organic remains that could provide evidence of prehistoric subsistence activities. It is recommended that this site be tested extensively. The intact portions (currently protected by roof fall), the disturbed portions, and areas of the site in front of the rock shelter and across the stream all should be investigated. It is impractical to preserve this site for several reasons: the mouth of the shelter is too large for a grill work to be erected, and the site is too isolated to make regular patrolling practical. Pot hunters have already had a serious impact on about 70% of the deposit, and currently are attempting to tunnel under the roof fall to reach the remaining deposits. The site is periodically inundated and is eroding. This is one of the most important sites in the project area.

Pw-83

This large rock shelter (see Chapter 8) has been frequently flooded and most of its cultural deposits probably have been seriously disturbed.

However, it retains considerable importance because of the presence of several pictographs. Such cultural resources are extremely rare in north-central and northeast Oklahoma. Substantial intact deposits exist in front of the shelter, but are being eroded by a meandering creek. The pictographs should be studied and recorded using infra-red, multi-negative, and/or other suitable processes. The intact areas, which have already been tested during this project, should be tested further in an attempt to recover diagnostic artifacts. Beyond this relatively minimal testing and study of the pictographs, the site should be protected from vandalism. Modern inscriptions have already partially defaced the pictographs. This site is relatively easy to reach and is visible from one of the major recreation areas. Regular patrolling by Corps personnel should be instituted at once.

Pw-89

This prehistoric site (see Appendix B) is easy to reach by boat, but a four wheel drive vehicle is needed to reach it by land. It is periodically inundated. This site was not tested by this project due to these access problems. A local collector discovered a Plainview point on the site, and it is thus the only likely Paleo-Indian site in the project area. it is not known how extensively wave action and periodic inundation have disburbed the deposits. However, because of the possibility of very early deposits, the site is of outstanding importance. This site should be tested, preferably during January or February because the lake pool is at its lowest ebb at this time. Otherwise, it should be patrolled regularly by boat, beginning at once, to protect it from valdalism.

Os-12

This prehistoric site (see Appendix B) is located along the Arkansas River. The site shows evidence of a widespread, 80 cm thick cultural deposit which is coextensive with what is probably a Copan-equivalent paleosol. The existence of a thick cultural deposit within a dated paleosol offers the opportunity to study camp or village life and perhaps cultural change as well within a temporally delimited context. Erosion by water action and extensive vandalism pose a double threat to this site. Thus, patrolling should begin at once and large scale excavations should be undertaken at the first opportunity.

Sites Recommneded for Additional Research

A number of sites may be eligible to the National Register, but information at this time is insufficient to make a definite determination. Also, some sites are almost completely destroyed, and likely will be totally destroyed within the next few years, but the small deposits currently remaining may produce significant information and should be tested in the near future. A number of these sites also should receive immediate protection from vandalism, to preserve the remaining deposits until it is possible to test them. Still other sites would profit from surface collections or from detailed mapping or photographic recording.

Cr-71

This prehistoric site (see Chapter 8) is significant because artifacts removed from it by collectors indicate the presence of Archaic, Plains Woodland, and Plains Village components. Neither thick deposits nor diagnostic artifacts were discovered in two test pits, but it is possible that the site is better preserved to the northeast. This site

deserves additional testing because it has the potential of producing important information on cultural change.

Cr-91

The most notable attributes of this rock shelter (see Appendix B) are an undisturbed deposit and a foot- or paw-shaped petroglyph. Because the site is well back from and elevated above the creek, the deposit is probably not in much danger from either erosive forces or pothunters. Thus, there is no immediate need to excavate it. The petroglyph, however, should be measured and photographed before it suffers any more weathering or the bluff wall collapses.

Os-22

This prehistoric site (see Chapter 8) is located in a major recreational area. The beach scatter below the deposit is regularly scoured by bathers and picnickers for artifacts. The deposit itself is coextensive with a paleosol and is being systematically chopped away by pothunters. Minimal testing several meters behind the bank failed to produce additional cultural materials, although both artifacts and human bone continue to erode out of the exposed deposit. Pottery was found on the beach scatter. Because this site has a well defined paleosol, it is recommended that more excavation be done to secure finer temporal control of the site and to determine whether it was a camp or a village. If the Corps were interested in conducting excavations which the public could view, this would be an ideal site.

Os-315

This prehistoric site (see Appendix B) consists of a petroglyph composed of five concentric circles. Because petroglyphs are not an exceedingly

common phenomenon in the project area and in north-central Oklahoma, it is recommended that it be drawn and photographed. This should be done as soon as possible because there is the possibility that the boulder into which the petroglyph was incised will be undercut by erosive forces and tumble into the lake.

Os-322

This prehistoric site (see Appendix B) has a low mound which should be tested to determine if it is natural or artificial. The mound is located on the flood plain of a meandering creek and will eventually be destroyed by erosive forces.

Os-365

The distinguishing attribute of this prehistoric site (see Appendix B) is a beach scatter with an abnormally high frequency of ground stone artifacts--both manos and metates. Because the activities on this site were apparently specialized, the site offers the opportunity to better define the tools and the activities involved in the processing of nuts and/or grains. (For programmatic statements on such an investigation see Moseley and Mackey [1972] and Schiffer [1975].) It is recommended that the beach scatter below this site be systematically collected and that the limits of the site be defined and a substantial portion excavated.

Os-399

This historic site (see Appendix B) consists of an undated and largely intact log cabin--probably the only one in the project area. It is recommended that the area surrounding the cabin be searched for diagnostic artifacts and that the cabin itself be measured and photographed before erosive forces cause it to be completely undermined by the gully toward which it leans.

Pw-95

This historic site (see Chapter 4 and Appendix B) consists of a circular, clay kiln in which many of the early bricks in the Cleveland area may have been fired. The kiln is located on the edge of a creek and will eventually be destroyed as the creek cuts away at its bank. Because of its historical significance in the Cleveland area, it is recommended that the kiln be cleaned out, measured, and photographed.

Pw-99-to-Pw-154

This cluster of prehistoric sites includes Pw-54 and the inundated Pw-155 (see Appendix B) and perhaps represents some sort of Plains Village Period (A.D. 900-A.D. 1600) enclave. Burials, T-shaped stone pipes, large bifacially-flaked knives, Caddoan pottery, polished stone celts, and a stone hoe have been found in this site cluster. Pw-94 and Pw-154 have perhaps been too severely eroded to provide much useful information, but it is recommended that at least the remaining elevated portions of Pw-54 and Pw-155 (see Appendix B) be tested to determine if camps or villages are represented. Pw-92 is also significant because it may be an upland continuation of Pw-155 where the exotic Caddoan pottery and a T-shaped pipe were found. Excavations at Pw-92 might shed some light on the processes by which the pottery and pipe entered the project area.

Pw-104 and Tu-36

These historic sites (see Appendix B) possess three circular depressions and a few nondiagnostic historic artifacts. It is recommended that at least one depression on each site should be tested to determine their historical significance. It is possible that the depressions are the collapsed dugouts of early homesteaders.

Pw-117 and Pw-81

Pw-117 is located on a point and is eroding from three sides. The beach shows extensive, already deflated, deposits, burnt rock, and numerous flakes. Collectors report recovering Archaic materials from this site. Very little of the deposit remains, and it seems impractical to retard the destruction of these deposits because of the site's situation. Pw-81 is located just to the east across a small inlet, and has produced both Archaic and Plains Village materials in the past. Again, erosion is occurring around three sides of the site, and very little of the deposit remains. These sites may have once been part of one larger area of occupation. As Pw-117, Pw-81 should be tested as soon as possible. Meanwhile, both sites should be patrolled more frequently in an attempt to limit vandalism.

Pw-134 and Pw-139

These historic sites (see Appendix B) have been identified as turn-of-the-century Indian villages, although neither produced definitive evidence of Indian occupation. Because of the historical significance of Indian villages in the project area, it is recommended that these two localities be carefully resurveyed and that each site be tested.

Pw-156

The two frame structures on this historic site (see Appendix B) were built in 1904 by the same man. One of the structures is a habitation and the other is a one-room schoolhouse. Both were built before statehood and at least the schoolhouse should be documented photographically.

Protection of Cultural Resources in the Project Area

It is difficult to decide whether erosional forces or recreational activities are more destructive of the cultural resources in the project area. Regardless, these two forces have already destroyed the bulk of the cultural remains of the area, and threaten to complete this destruction in the near future. Because of the already extensive erosion and the nature of ongoing erosive forces, it seems impractical to protect any of the individual sites in the project area from destruction caused by the lake itself. However, it should be possible to retard the loss of deposits and cultural remains caused directly by human action.

Currently, it appears that only minimal efforts are made to discourage vandalism at the sites in the project area. Many sites occur in recreational areas operated by the Corps of Engineers or by the Oklahoma Department of Tourism and Recreation, and thus are especially susceptible to recreational collecting. Several such sites are "protected" by signs warning of penalties for illegal collecting, but no realistic effort is being made to protect these resources. In many instances, it is likely that field personnel are not aware of the regulations covering illegal collecting or of the existence of specific resources in the areas for which they are responsible. Thus, to a certain extent, the problem is one of education. Field personnel should be instructed in the need to protect these resources, on the applicable regulations, and on the location of specific resources in their areas of responsibility. Warning signs placed on or near individual sites are thought to be counterproductive--they simply alert collectors to the existence of sites in specific areas. Therefore, all warning signs should be posted only at general access points

and not near individual sites. Greater attention should be paid to patrolling sites, and it seems likely that additional personnel time needs to be devoted to this effort.

Informant interviews and observations of changing lake conditions provide some information on optimal patrolling periods. Most collecting is done after rains, when the lake level changes (particularly when it falls markedly), during weekends, in the evening, and on holidays. Planning for purposive lake level changes should therefore include attention to the need to patrol site areas at these times. If possible, extra time needs to be devoted to patrolling the area during off-hours--this is particularly important if protection measures are to be effective. January through March is the period when the lake pool is at its lowest, and many collectors reported that these were their most productive months. Patrolling activities should be increased during this period. Patrolling should be accomplished by boat, as this is the most efficient means of reaching the widely scattered collecting localities.

Some localities deserve particular attention. These localities are in addition to the individual sites mentioned previously in this chapter. Such localities contain high concentrations of individual sites, and have been identified by collectors as favored places for recreational collecting. These localities include the following:

1) between Cr-138 and Cr-78;

2) between Os-12 and Os-6; Os-332;

3) between Os-22 and Os-375 and north to the project boundary;

4) between Pw-94 and Pw-154;

5) between Pw-114 and Pw-118;

6) between Pw-152 and Pw-141 and the entire peninsula below Pw-141.

Other Sites

All other sites, which represent the majority of those found in the project area, are not recommended for any additional work, except that patrolling efforts should attempt to keep collecting activities at these sites to a minimum. These sites have already been seriously damaged, and contain very minimal extant deposits that are likely to produce no significant information of the history or prehistory of the area. These sites are identified in Table 7-5 and Appendix C.

In conclusion, the majority of sites in the project area have been so extensively damaged by lake forces and collecting activities that they contain little or no significant deposit. Therefore, no additional work is recommended for these sites, besides an increase in the level of protection from vandalism that they receive. The few sites singled out for additional research are of outstanding importance since they represent the last remnants of the culture history of the project area. Most of these sites are threatened by ongoing erosion and/or vandalism, and therefore it is imperative that they receive attention as soon as possible.

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APPENDICES

APPENDIX A

SOIL ASSOCIATIONS

Creek County

Wooded Uplands Association

Series	Family	Subgroup	Order
Darnell	loamy, siliceous, thermic, shallow	Udic Ustochrepts	Inceptisols
Pottsville	N/A	N/A	N/A
Eufaula	sandy, siliceous, thermic	Psammentic Paleustalfs	Afisols

Well drained and moderately sloping to steep, rolling to hilly, sandy and silty loamy soils.

Bottomlands Association

Series	Family	Subgroup	Order
Yahola	coarse-loamy, mixed, calcareous, thermic	Typic Ustifluvents	Entisols
Reinach	coarse-silty, mixed, thermic	Pachic Haplustolls	Mollisols

Well drained to somewhat poorly drained, nearly level to gently sloping, silty, loamy and clay soils.

Prairie Association

Series	Family	Subgroup	Order
Collinsville	loamy, mixed, thermic	Lithic Hapludolls	Mollisols
Talahina	clayey, mixed, thermic, shallow	Typic Hapludolls	Mollisols

APPENDIX A (Continued)

Osage County

Wooded Uplands Association

Series	Family	Subgroup	Order
Niotaze	fine, montmorillonitic, thermic	Aquic Paleustalfs	Mollisols
Darnell	loamy, siliceous, thermic	Udic Ustochrepts	Mollisols

Moderately deep and shallow, gently sloping to steep, loamy soils over shale and sandstone; on ridge crests and sideslopes.

Dougherty	loamy, mixed, thermic	Arenic Haplustalfs	Alfisols
Eufaula	sandy, siliceous, thermic	Psammentic Paleustalfs	Alfisols

Deep, nearly level to moderately steep, sandy soils over sandy sediments.

Darnell	loamy, siliceous, thermic	Udic Ustochrepts	Mollisols
Stephenville	fine, loamy, siliceous, thermic	Ultic Haplustalfs	Alfisols

Shallow and moderately deep, very gently sloping to sloping, loamy soils over sandstone.

Bottomlands Association

Series	Family	Subgroup	Order
Kiomatia	sandy, mixed, thermic	Typic Udifluvents	Entisols
Mason	fine-silty, mixed, thermic	Typic Argiudolls	Mollisols
Roebuck	fine, montmorillonitic, thermic	Vertic Hapludolfs	Mollisols

Deep, nearly level and very gently sloping, well drained to somewhat poorly drained, sandy and loamy soils.

APPENDIX A (Continued)

Pawnee County

Wooded Uplands Association

Series	Family	Subgroup	Order
Darnell	loamy, siliceous, thermic	Udic Ustochrepts	Inceptisols
Talahina	clayey, mixed, thermic, shallow	Typic Hapludolls	Mollisols
Stephenville	loamy, siliceous, thermic	Udic Ustochrepts	Inceotisols
	fine, loamy, siliceous, thermic	Ultic Haplustalfs	Alfisols

Light-brown, fine sandy loam of the rolling to rough forested uplands.

Bottomlands Association

Series	Family	Subgroup	Order
Port	fine-silty, mixed, thermic	Cumulic Haplustolls	Mollisols
Yahola	coarse-loamy, mixed, calcareous, thermic	Typic Ustifluvents	Entisols
Dale	fine-silty, mixed, thermic	Pachic Haplustolls	Mollisols
Brewer	fine, mixed, thermic	Pachic Argiustolls	Mollisols

Deep silty loam, fine sandy loam and silty clay loam soils of the floodplains and low benches.

Norge	fine-silty, mixed, thermic	Udic Paleustolls	Mollisols
Teller	fine-loamy, mixed, thermic	Udic Argiustolls	Mollisols
Vanoss	fine-silty, mixed, thermic	Udic Argiustolls	Mollisols

Reddish fine sandy loam, silt loam soils of the smooth to rolling areas.

Dougherty	loamy, mixed, thermic	Arenic Haplustalfs	Alfisols
Eufaula	sandy, siliceous, thermic	Psammentic Paleustalfs	Alfisols

Light brown, fine sandy loam and loamy fine sand soils of the wavey sandy areas.

APPENDIX A (Continued)

Pawnee County (Continued)

Prairie Association

Series	Family	Subgroup	Order
Dennis	fine, mixed, thermic	Aquic Paleudolls	Mollisols
Bates	fine-loamy, siliceous, thermic	Typic Argiudolls	Mollisols
Talahina	clayey, mixed, thermic, shallow	Typic Hapludolls	Mollisols
Sogn	N/A	N/A	N/A

Greyish-brown fine silty loam soils of the rolling prairie uplands.

Payne County

Payne County soil survey was not yet published at the time this report was written.

Tulsa County

Wooded Uplands Association

Series	Family	Subgroup	Order
Okay	fine-loamy, mixed, thermic	Typic Argiudolls	N/A
Kamie	fine-loamy, mixed, thermic	Typic Plaeudalfs	N/A

Deep, nearly level through sloping, well drained, sandy or loamy soils that have a loamy soil subsoil over loamy sediments.

APPENDIX A (Continued)

Tulsa County (Continued)

Series	Family	Subgroup	Order
Niotaz	fine, montmorillonitic, thermic	Aquic Paleustalfs	Mollisols
Darnell	loamy, siliceous, thermic shallow	Udic Ustochrepts	Mollisols

Moderately deep to shallow, gently sloping through steep, somewhat poorly drained or somewhat excessively drained, gravelly to stoney, loamy soils that have a gravelly to stoney, clayey to stoney loamy subsoil over shale or sandstone.

Bottomlands Association

Series	Family	Subgroup	Order
Choska	coarse-silty, mixed, thermic	Fluventic Hapludolls	N/A
Severn	coarse-silty, mixed (calcareous), thermic	Typic Udifluvents	N/A

Deep, nearly level, well drained, loamy soils over loamy and sandy material.

N/A: Information not available.

APPENDIX B

ADDITIONAL DESCRIPTIVE AND HISTORICAL INFORMATION

FOR SELECTED SITES

Cr-81

Brighton (1952:22) reported this historic site as Feature #21: ". . . according to early settlers, [this site] was an old Creek Indian village. I visited the general area twice, but was unable to locate the spot." A similar search of the area by an ARA survey team produced the same negative results. Archival research and/or text excavations may be required to determine if there was a village in this locale.

Cr-90

This historic site consists of a low cave that had been walled-in with sandstone blocks and mortar. Part of the wall has since been knocked down. The cave is approximately 3 m wide at its mouth. No features or artifacts are visible in or arround the cave.

Cr-91

This prehistoric site has two small rock shelters with what appears to be an undisturbed deposit. There is a conical bedrock mortar in front of the rock shelters and on the wall of the east shelter there is a foot- or paw-shaped petroglyph associated with several open-ended grooves. The body of the foot or paw is shaped like an elongated pear. It is 22 cm long and 10 cm wide. The five toes or claws are each approximately 10 cm long. The largest groove is 32 cm long and 6 cm wide.

Os-12

This prehistoric site was first reported by Brighton (1952:17-18). Its most notable features are its length (approximately 400 m), a thick paleosol with cultural debris throughout, and a sizeable deposit behind a river-cut bank. The exposed paleosol is as much as 85 cm in thickness and probably of Copan age (see Chapter 5). In some areas perhaps 15 to 20 m of deposit remain behind the bank. Brighton reported that this site was located in a plowed field and more recently several pits have been cut into the deposit by pothunters. Nevertheless, a deep and substantially undisturbed deposit remains to be investigated. Artifacts observed on the site include fire-cracked rock, debitage, cores, a point fragment, cupstones, manos, and metate fragments.

Os-315

This prehistoric site is a petroglyph composed of five concentric circles, the largest having a diameter of 18.50 cm. The petroglyph was incised in the horizontal face of a boulder which is presently on the shoreline of a third order creek.

Os-322

This prehistoric site has a possible mound measuring 12 m x 6 m and .75 m in height. There is a slight depression in the center. There is no fire-cracked rock or artifacts directly associated with the mound. More than likely it is the same sort of natural mound which was tested at Cr-73 (see Chapter 8). Unfortunately, circumstances did not permit the mound to be tested.

Os-365

This prehistoric site is located on a major secondary drainage of the Arkansas River. Fire-cracked rock and artifacts appear to be eroding out of a dune-covered deposit onto a beach (see Chapter 5). This site is distinguished by an abnormally high concentration of ground stone--both manos and metates. The subsistence activities on this site were clearly specialized.

Os-368

This historic site consists of a concrete structure (2.44 m x 1 m) built over a spring in a drainage gulley. The structure is attached to a large sandstone bedrock slab and may have served as a water source and/or a spring house.

Os-399

This historic site consists of a partially collapsed log cabin measuring 6 m x 3.5 m and 2.5 m in height. The roof and a portion of the walls below the eaves are covered with corrugated tin sheeting. The walls below the sheeting are not chinked. No artifacts were observed in the thick undergrowth surrounding the structure, which sits on the eastern edge of the Boston Pool oil field.

Pw-89

This site is a possible Paleo-Indian site. A Plainview point was discovered on the beach below an eroded bank by informants 2a and 2b. An ARA survey team subsequently discovered circumstantially corroborating evidence in the form of two large flake blades; these were also discovered on the beach. The blades are significant because they indicate that

the occupants of the site were adept at producing flakes of the size required to manufacture a Plainview point. Unfortunately, these blades were stolen before they could be measured or photographed. The areal extent and the degree of integrity of the remaining deposit are not known. The beach scatter below the site is roughly shaped like the upper case letter Omega of the Greek alphabet. The arc is presently a shallow cove which prehistorically may have been the midsection of the site. The point and the blades were discovered at the southern extreme of the site.

Pw-90

This inundated site was known as the "Place of the Eels." Bert Jordan, a Cleveland resident and a knowledgeable amateur historian, reports that during the nineteenth century bargemen plying the Arkansas River would catch and eat the eels which spawned on the bluff rock at the confluence of the river and what is now referred to as Feyodi Creek. Jordan says that the bargemen were also attracted by the potable water of the spring-fed creek. He believes that Indian artifacts were found on this site.

Pw-91

This inundated site is known as the "Blue Hole." It consisted of a spring-fed waterfall and pool around which local residents would picnic and where wayfarers traveling an old road through the area would camp. Mr. and Mrs. Fred Shaeffer, Rural Route 1, Sand Springs, report that Indian artifacts were found around the Blue Hole.

Major John W. "Cherokee" Jordan (Ret.). Jordan had participated in the Battle of Round Mountain on the Union side and was Indian agent in the Cherokee Strip when the log structures were built in 1884. The two-room dugout, if it was built on the same site (see Argue 1937:403), was built a year earlier. The fort was built by Jordan to protect his family from "Boomer" raids eminating out of Chicaska, near the Kansas line. The fort was an elevated, cabin-like structure equipped with loop holes through which residents could fire at attackers. Accounts of the genesis of the fort vary. William T. Argue (1937:403) writes that it was "on top of the stable," while Jordan's son, Bert, of Cleveland, reports that it was originally a corn crib (1979, personal communication). Evidence of the buildings is now almost totally obscured. An informant who resides across the street from the site reports that the structures burned down "10 to 20" years ago. Bert Jordan says that local people had removed many of the timbers for firewood and fence posts and the Corps had bull dozed the remaining evidence after purchasing the property. A few sandstone blocks are perhaps all that remain of the structures. At the Triangle Oil and Historical Museum, west of Cleveland on Highway 64-99, there is now a 1:1 model of the cabin as well as enlarged photographs of the cabin and the fort. The latter photograph is by William S. Prettyman and is included in a volume of his work (Prettyman 1957: Plate 117); presumably the other photograph is his work as well.

Pw-133

This inundated site is reported to have been a turn-of-the-century Indian cemetery. The Shaeffers report that there were extended burials with headstones.

Pw-95

The project area cuts across what was once the Balmer homestead. This site consists of a brick kiln which was built by Balmer. His dugout is located about 75 m to the west on the property of a Mr. and Mrs. Kranert, who filled in the dugout to drive away the resident snakes and who supplied information about the kiln and Mr. Balmer. In constructing the kiln, Balmer dug a pit 2.30+ m deep and 1.75 m in diameter and lined it with 25 cm of clay which was then coated with a blue-green glaze. A flue, the interior aperture of which is now obscured by humus, was constructed on the east side of the kiln. The exterior aperture has probably been obscured by the slumping bank and part of the clay lining may have been cut away by water action. (The kiln was inundated in the 1974 flood.) The Kranerts believe that some of the first bricks in the Cleveland area may have been fired in this kiln. Balmer was an early postmaster and storekeeper in the area and the hill to the west of the site bears his name.

Pw-104

This historic site consists of three roughly circular depressions which are each approximately 4 m in diameter and between 0.50 and 1.0 m in depth. Artifacts are limited to a section of galvanized stove pipe and some wire, both of which were discovered in the bottom of one depression. They are similar in form and number to those found at Tu-36 and perhaps are the collapsed remains of homesteader dugouts.

Pw-119

This historic site consisted of a least two cedar log buildings--a cabin and a "fort"--and perhaps a dugout. This was the homestead of

Pw-134 and Pw-139

These sites are reported to be in the general vicinity of turn-of-the-century Indian villages. Fred Shaeffer reports that between "80 and 85 years ago" his grandmother sold cherry pies to Indians living on or near these sites. Although fire-cracked rock may be associated with Pw-139, neither site produced definitive evidence of Indian occupation.

Pw-146

A Plainview point was found on a beach scatter below this site by informant 10. The site was inundated at the time it was visited by an ARA survey team.

Pw-155

Informants 9a and 9b collected two Caddoan artifacts from this prehistoric site before it wa inundated. One of these artifacts was a stone, T-shaped pipe similar to Figure 27a in Bell (1980). The pipe had been polished and hatchured triangles and rectangles had been carved on the stem projection. The other artifact was the greater part of a pottery bowl which fits the description of Crockett Curvilinear Incised (see Brown 1971:Figure 10f), a type assigned on stylistic grounds to the Harlan Phase by James A. Brown (1971:220). Obvious Caddoan artifacts were not found by ARA survey teams on Pw-92, which may be the upland continuation of Pw-155.

Pw-156

This historic site consists of two standing frame structures, one a farmhouse and the other a one-room schoolhouse. Both were built in 1904 by the same individual. Information about these structures was supplied by Mrs. Fred Shaeffer, who lived in the house and attended the

school. She reports that her teacher was a Mrs. Jordan, who is still living and whose husband, Bert, is also cited in this appendix.

Tu-29 and Tu-34

These historic sites consist of mounds (1 and 9 or more, respectively) of unshaped sandstone blocks. Apart from not being covered by humus, the mounds offer no clue as to their age. However, the Shaeffers suggest that they were the work of a Mr. Rupp, who was a local stone mason. Rupp lived in what is now Keystone State Park and a bunker-like concrete and sandstone cistern base still marks the site (Tu-24) where his house stood.

Tu-31

This historic site consists of a rectangular depression in a shallow slope. The depression is 4.5 m long, 3.8 m wide, and 0.5 m deep. There are no artifacts beyond a nearby (15 m) bottle fragment with the molded inscription "California Syrup Co."

Tu-36

This historic site consists of three roughly circular depressions, each approximately 5 m in diameter, and an ovoid flat-bottomed depression with dimensions of 7 m x 5 m. The artifacts observed on the site were corrugated metal roofing, a metal "gas" can with a hand soldered seam, and a brick. It is possible that the roughly circular pits are domestic dugouts of homesteaders. They are similar in form and number to those discovered at Pw-104. The flat-bottomed depression is similar to one discovered at Tu-35.

Tu-37

This historic site consists of three dry-laid "walls" set on a concrete foundation which extends outward to form an apron. The side

walls consist of roughly shaped sandstone blocks and are approximately 2.5 m long, 1.4 m wide, and 1 m high. The back wall was barely visible because of slope wash and humus but appeared to consist of fire bricks. Some sort of well casing--with a 20 cm exterior diameter--rests against the back wall. This "structure" was perhaps a spring house or the foundation of an oil derrick, although the walls are not stained with oil. This presently isolated site is located on the narrow bottoms of a first-order creek.

Tu-38

This site is reported to be a historic Indian cemetery. There are at least five graves within the fenced off area. Four are indicated by sandstone blocks and the fifth by a "temporary" metal marker. None of the markers possess names or biographical information.

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APPENDIX C

CONDITION OF PREVIOUSLY RECORDED SITES IN THE KEYSTONE LAKE PROJECT AREA

Site No.	Site No. Assigned	Outside Project Area	Site Not Visited	Evidence Present	Evidence Absent	Notes
Cr-1			x			Permanently inundated.
Cr-2					x	Silted over and intermittently inundated.
Cr-3					x	Difficult to locate. Either silted over or covered by dense grasses.
Cr-4					x	Silted over and covered by dense grasses and shrubbery.
Cr-5					x	Silted over and intermittently inundated.
Cr-6					x	Silted over and intermittently inundated.
Cr-7					x	Silted over and intermittently inundated.
Cr-8				x		Condition of site essentially unchanged. There are two recent shallow shovel trenches, the longest being less than 1 m in length.
Cr-9		x	x			
Cr-10		x	x			
Cr-11				x		Several flakes were visible on dirt road. Site is covered by dense grasses. Auger tests were negative.
Cr-12			x			Permanently inundated.
Cr-13			x			Permanently inundated.

APPENDIX C (Continued)

Site No.	Site No. Assigned	Outside Project Area	Site Not Visited	Evidence Present	Evidence Absent	Notes
Cr-14			x			Permanently inundated.
Cr-56		x	x			
Cr-57		x	x			
Os-6				x		The greater part of this lake front site has probably been eroded away.
Os-7		x	x			
Os-8		x			x	Covered by dense grasses.
Os-9		x	x			
Os-10			x			Permanently inundated.
Os-11				x		The greater part of this lake front site has probably been eroded away.
Os-12				x		See Chapter 14.
Os-13			x			Permanently inundated.
Os-14		x				
Os-15					x	There are three independent reports of artifacts having been found on this location.
Os-16			x			Intermittently, if not permanently, inundated.
Os-17			x			Permanently inundated.
Os-18			x			Permanently inundated.
Os-19						Permanently inundated.
Os-20		x				
Os-21			x			Intermittently, if not permanently, inundated.

APPENDIX C (Continued)

Site No.	Site No. Assigned	Outside Project Area	Site Not Visited	Evidence Present	Evidence Absent	Notes
Os-22				x		In Walnut Creek Peninsula Recreation Area. Test excavations conducted; see Chapter 8.
Os-23			x			Intermittently, if not permanently, inundated.
Os-24			x			Permanently inundated.
Os-25		x	x			
Os-26					x	Covered over, if not destroyed, during the construction of State Highway 64
Os-183				x		In Walnut Creek Peninsula Recreation Area. Test excavations conducted; see Chapter 8.
Os-222				x		In Walnut Creek Peninsula Recreation Area. Condition of site essentially unchanged.
Os-223				x		In Walnut Creek Peninsula Recreation Area. Condition of site essentially unchanged.
Os-224				x		In Walnut Creek Peninsula Recreation Area. Condition of site essentially unchanged.
Os-225				x		In Walnut Creek Peninsula Recreation Area. Condition of site essentially unchanged.
Os-226				x		In Walnut Creek Peninsula Recreation area. Condition of site essentially unchanged.
Os-227				x		In Walnut Creek Peninsula Recreation area. Condition of site essentially unchanged.
Os-228				x		In Walnut Creek Peninsula Recreation area. Condition of site essentially unchanged.
Os-229				x		In Walnut Creek Peninsula Recreation area. Condition of site essentially unchanged.

APPENDIX C (Continued)

Site No.	Site No. Assigned	Outside Project Area	Site Not Visited	Evidence Present	Evidence Absent	Notes
Pw-1			x			Permanently inundated.
Pw-2			x			Permanently inundated.
Pw-3					x	In Sandy Park Recreation Area. Inspection of gully walls and dirt road and shovel tests all proved negative. Site covered by dense grasses.
Pw-4					x	In Sandy Park Recreation Area. Site covered by dense grasses.
Pw-5					x	In Pawnee Cove (S) Recreation Area. Covered by dense grasses and a paved road.
Pw-6					x	In Pawnee Cove (S) Recreation Area. Covered by dense grasses and paved road in picnic area.
Pw-7					x	Covered by dense grasses and shrubbery.
Pw-8		x	x			
Pw-9		x			x	Covered by dense grasses and shrubbery.
Pw-10				x		More of site apparently exposed by erosion. Prehistoric and historic debris are mixed together. Woodland ceramics and a Fresno point were found.
Pw-11					x	Intermittently, if not permanently, inundated.
Pw-12			x			Permanently inundated.
Pw-13			x			Permanently inundated.
Pw-14		x	x			

APPENDIX C (Continued)

Site No.	Site No. Assigned	Outside Project Area	Site Not Visited	Evidence Present	Evidence Absent	Notes
Pw-15					x	Covered by dense grasses.
Pw-16		x	x			
Pw-17		x	x			
Pw-18		x?		x		Cultural remains may be washing down onto the project area. Access to site denied by landowner.
Pw-19					x	Covered by humus and silt. Concrete boat ramp built on site. Intermittent inundation.
Pw-20			x			Permanently inundated.
Pw-21				x?		Thinly covered by scattered grasses. A lake front site, one piece of fire-cracked rock was visible in the upper 10 cm of the bank.
Pw-22					x	In Feyodi Creek Recreation Area. Covered by paved road and planted grass or perhaps entirely eroded away.
Pw-23					x	In Feyodi Creek Recreation Area. Site largely covered by gravel and asphalt and planted grasses.
Pw-24			x			Permanently inundated.
Pw-25		x?			x	Covered by dense grasses. Condition of site essentially unchanged.
Pw-26					x	The greater part, if not all, of this lake front site has probably been eroded away. Area above bank is covered by dense grasses.

APPENDIX C (Continued)

Site No.	Site No. Assigned	Outside Project Area	Site Not Visited	Evidence Present	Evidence Absent	Notes
Pw-27			x			Permanently inundated.
Pw-28				x		Above the normal lake level, the site is suffering from slope wash and shoreline erosion.
Pw-29				x(?)		Above the normal lake level, the site is suffering from slope wash and shoreline erosion.
Pw-30		x	x			
Pw-31					x	Covered by dense grasses and shrubbery.
Pw-32						Inundated at the normal lake level. Situation and shoreline erosion are taking place.
Pw-33					x	Covered by dense grasses.
Pw-34			x			Permanently inundated.
Pw-35			x			Currently inundated. Collected by Informant #7.
Pw-36					x	In Cowskin Bay (S) Recreation Area. Only 20th century artifacts were found at this location.
Pw-37			x			Permanently inundated.
Pw-38			x			Permanently inundated.
Pw-39		x	x			
Pw-40		x	x			
Pw-41					x	Covered by dense grasses and perhaps silt.
Pw-42					x	Covered by dense grasses and shrubbery. Inspection of hiking trail crossing site proved negative.

APPENDIX C (Continued)

Site No.	Site No. Assigned	Outside Project Area	Site Not Visited	Evidence Present	Evidence Absent	Notes
Pw-43			x			Permanently inundated.
Pw-44			x			Permanently inundated.
Pw-45					x	Covered by dense grasses and shrubbery.
Pw-46					x	Covered by dense grasses and shrubbery.
Pw-54				x		A considerable portion of the site has eroded away. The locality of the burial is now intermittently, if not permanently, inundated.
Pw-55		x	x			
Py-1		x	x			
Py-32		x	x			
Py-40		x	x			
Tu-1			x			Permanently inundated.
Tu-2		x	x			
Tu-3			x			Permanently inundated.
Tu-13		x	x			
F-1			x			Permanently inundated.
F-2	Pw-81			x		This may be Pw-81; see Table 7-5.
F-3			x			Insufficient information in legal description of location.
F-4		x	x			Probably mislocated.

APPENDIX C (Continued)

Site No.	Site No. Assigned	Outside Project Area	Site Not Visited	Evidence Present	Evidence Absent	Notes
F-5			x			Permanently inundated.
F-6			x			Permanently inundated.
F-7	Cr-118			x		This may be Cr-118; see Table 7-5.
F-8			x			Insufficient information in legal description of location. Feature has probably silted over.
F-9			x			Insufficient information in legal description of location.
F-10					x	Covered by dense grasses.
F-11		x	x			
F-12			x			Insufficient information in legal description of location. Probably permanently inundated.
F-13		x	x			
F-14		x	x			
F-15			x			Permanently inundated.
F-16		x	x			
F-17			x			Insufficient information in legal description of location. Probably silted over.
F-18			x			Insufficient information in legal description of location. Either permanently inundated or outside project area.

APPENDIX C (Continued)

Site No.	Site No. Assigned	Outside Project Area	Site Not Visited	Evidence Present	Evidence Absent	Notes
F-19			x			Insufficient information in legal description of location.
F-20		x	x			
F-21	Cr-81				x	Either silted over or non-existent; see Table 7-5.
F-22		x	x			
F-23			x			Probably permanently inundated.
F-24	Os-309				x	This may be debris from Os-309. See Chapter 8.

DATE

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